421-E-3 D301.45/27-4:87-43

AFHRL-TP-87-43

AIR FORCE HUMAN RESOURCES LABORATORY

TRAINING DEVELOPMENT UNDER LOGISTICS SUPPORT ANALYSIS

421-E-39

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April 1988

Final Technical Paper for Period February - November 1986

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Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188

1a REPORT SECURITY CLASSIFICATION Unclassified	1b RESTRICTIVE MARKINGS
2a SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b DECLASSIFICATION / DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S) AFHRL-TP-87-43
6a NAME OF PERFORMING ORGANIZATION Systems and Applied Sciences Corporation (SASC) 6b OFFICE SYMBOL (If applicable)	7a NAME OF MONITORING ORGANIZATION Logistics and Human Factors Division
6c ADDRESS (City, State, and ZIP Code) 2875 Presidential Drive, Suite 300 Fairborn, Ohio 45324-6269	7b ADDRESS (City, State, and ZIP Code) Air Force Human Resources Laboratory Wright-Patterson Air Force Base, Ohio 45433-6503
8a NAME OF FUNDING / SPONSORING ORGANIZATION Air Force Human Resources Laboratory 8b OFFICE SYMBOL (If applicable) HQ AFHRL	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F33615-84-C-0061
8c ADDRESS (City, State, and ZIP Code) Brooks Air Force Base, Texas 78235-5601	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO: 63106F PROJECT NO: 2940 TASK NO: 04 WORK UNIT ACCESSION NO: 01

11 TITLE (Include Security Classification)
Training Development Under Logistics Support Analysis

12 PERSONAL AUTHOR(S)
Staten, C.M.; Boyle, E.

13a TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
Final	FROM Feb 86 TO Nov 86	April 1988	92

16 SUPPLEMENTARY NOTATION

17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	front-end analysis; integrated logistics support; full-scale development; logistics support analysis; instructional system development (Continued)
05	09		
15	05		

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

This technical paper explores the development of training requirements based on the use of logistics support analysis (LSA) procedures and logistics support analysis record data. It examines system program offices' and other organizations' training development and LSA methods in light of the overall effort to develop and maintain the training development plan used during acquisition. It also focuses on the existing procedures followed by Air Force personnel in performing instructional system development analyses for defining maintenance training programs, and looks at selected contractor training development products. The paper includes information on the unified data base (UDB), as an improved, fully automated on-line interactive LSAR information system, and evaluates its potential for training development purposes.

20 DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21 ABSTRACT SECURITY CLASSIFICATION Unclassified
22a NAME OF RESPONSIBLE INDIVIDUAL Nancy J. Allin, Chief, STINFO Office	22b TELEPHONE (Include Area Code) (512) 536-3877 22c OFFICE SYMBOL AFHRL/TSR

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE

Unclassified

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II

Item 18 (Concluded):

logistics support analysis record
manpower, personnel, and training
maintenance training
program management
system program office
test and evaluation
training development
training development plan
unified data base
weapon system acquisition

AFHRL Technical Paper 87-43

April 1988

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This publication is primarily a working paper. It is published solely to document work performed.

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SUMMARY

The design and development of the Unified Data Base (UDB) for use in acquisition logistics entailed development of software for a fully automated, on-line, interactive Logistics Support Analysis Record (LSAR) information system. In addition, the potential usefulness of LSAR in training development and training application of the UDB (UDB2000) was investigated.

This technical paper documents the examination of developing training requirements based on the use of LSAR data and LSAR procedures to perform training planning and development needs as they arise in the Air Force. A two-fold review process was used to assess the present methods and data elements used in training development. First, a review was made of the Logistics Support Analysis process, completeness of LSAR and LSAR data elements, and the present process of training development. Secondly, the 3306 Test and Evaluation Squadron (TES), Edwards AFB, California, conducted a review and evaluation of LSAR and the application of the UDB. Recommendations are provided for improved training development procedures, including the use of the LSAR and UDB2000.

PREFACE

This technical paper was prepared by Systems and Applied Sciences Corporation (SASC), 2875 Presidential Drive, Fairborn Ohio, under Air Force Contract No. F33615-84-C-0061. Mr. Richard Diehl was the Project Leader, and Mr. Carroll M. Staten was the Principal Investigator. The Air Force Human Resources Laboratory (AFHRL), Logistics and Human Factors Division Acquisition Logistics Branch, Wright-Patterson Air Force Base, Ohio, was the sponsor. Captain Everton Wallace was the Program Manager.

SASC, under contract with AFHRL, developed the Unified Data Base (UDB), as an automated Logistics Support Analysis Record (LSAR) system to satisfy the requirements of the Logistics Support Analysis (LSA) process as defined by MIL-STD-1388-1A and the data elements defined by MIL-STD-1388-2A. In this review, SASC was to identify a functional area requiring a more thorough examination of additional LSA requirements. Training development under LSA was selected for additional study and for recommendations for correcting deficiencies. This technical paper focuses on training requirements, usefulness of LSAR data, and applications of UDB in training requirements determination.

ACKNOWLEDGEMENTS

The authors also wish to acknowledge the assistance and cooperation of the many individuals who contributed information and/or critiques to this paper.

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I. INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

A. The design and development of the Unified Data Base (UDB) for Acquisition Logistics project will develop an automated on-line Logistics Support Analysis Record (LSAR) for use by contractors and Government personnel. A subtask of this project was to study the potential usefulness of LSAR in training development and training applications of the UDB (UDB2000).

B. The LSA process, as defined by MIL-STD-1388-1A, and the LSAR process, as defined by MIL-STD-13882A, were evaluated for the purpose of increasing the effectiveness of Logistics Support Analysis (LSA) in influencing weapon system supportability. Based upon the UDB2000 capability to fully automate the LSAR process, it was determined that a functional LSA user area should be identified for a more thorough examination of additional LSA requirements. The functional area selected was to be an area which lacked the information, data analysis methodology, or documentation to influence supportability on a timely basis. This technical paper thus focuses on the area of training requirements in relation to the usefulness of LSAR data and applications of UDB2000.

C. Training requirements were examined based upon the ability of LSAR data and LSAR procedures to fulfill training planning and development needs as they arise in the Air Force. The Air Training Command's (ATC) 3306 Test and Evaluation Squadron (TES) was made a part of the study effort since its mission is to plan for system maintenance training during system acquisition/test and evaluation. The 3306 TES uses the Instructional System Development (ISD) process as the primary tool in training development. The 3306 TES assisted in the review and evaluation of current use and adequacy of MIL-STD-1388-1A and MIL-STD-1388-2A, and the adaptability of the UDB.

1.2 LOGISTICS SUPPORT ANALYSIS

A. Logistics Support Analysis (LSA), as defined in MIL-STD-1388-1A, is the selective application of scientific and engineering efforts undertaken during the acquisition process, as part of the system engineering and design process, to assist in complying with supportability and other Integrated Logistics Support (ILS) objectives. The LSA process applies to all system and acquisition programs, major modification programs, and research and development projects throughout all phases of the system/equipment life cycle. LSA should bring together all the design and support concepts needed to meet operational requirements through examining how functions will be performed meeting technical requirements, and considering system engineering trade-offs.

B. The analysis process provides general support requirements and descriptions of tasks which permit flexibility in tailoring to meet program objectives as determined by the System Program Office (SPO).

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This tailoring process can occur only when the "requiring authority" (usually the Government) requires that these specific tasks be done and that all essential information relevant to implementation be provided by the "performing activity" (usually a contractor). The process is applied in accordance with MIL-STD-1388-1A, which provides a basis for the selection of tasks to be included in the contract Statement of Work (SOW). It is intended that this systematic and comprehensive analysis be conducted on an iterative basis. The level of detail and timing of task performance should be consistent with program schedules and milestones.

C. In addition, the tailoring process prescribes the use of other LSA documentation on tasks performed in previous program phases, other system engineering program requirements and logistics related Data Item Descriptions (DID) included in the solicitation document. This accumulation of documentation will provide an audit trail of supportability and supportability-related design analyses and decisions, and will form the basis for actions and documents related to manpower and personnel requirements, resource allocation, training programs, maintenance planning, provisioning, funding, and other logistics support resource requirements.

D. The bringing together of the design and support concepts, of course, lies with the program manager. It is through SPO emphasis during system engineering that LSA can be applied to influence design and supportability. An example could be maintainability, which during the design phase incorporates accessibility, interchangeability, standardization, etc., and affects panel design, spares, technical manuals and corresponding personnel/training needs.

1.3 DATA DOCUMENTATION

A. Data documentation under the LSA process can be considered unique, as it is to be accomplished on an iterative basis through all phases of the system or equipment life cycle with the goal of satisfying the support analysis objectives. The documentation is to consist of all data resulting from the analysis tasks and serves as the primary source of validated, integrated design related supportability data pertaining to acquisition programs. Here lies one of the key issues with LSA and LSA documentation: Successful use of the standard depends upon the quality and completeness of the documentation. As defined in the standard: "LSA documentation shall be developed and maintained, commensurate with design, support, and operational concept development, and shall be updated to reflect changes or availability of better information based on testing, configuration changes, operational concept changes, and support concept changes during the acquisition process." Documentation which is complete, accurate, and up-to-date, provides a suitable basis for necessary actions and documentation for manpower and personnel requirements, training programs, and other requirements previously stated.

B. This documentation process is performed using the Logistics Support Analysis Record (LSAR), which requires the use of many related documents from which appropriate data/codes can be obtained. The

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LSAR data are to serve as the integrated logistics support technical database applicable to all materiel acquisition programs. To this end, a standard Joint Service LSAR Automated Data Processing (ADP) system for automation of LSAR data has been developed. This system generates the LSAR master files described in MIL-STD-1388-2A. The LSAR data, whether collected through automation or manually, forms the necessary database.

1.4 TASKS AND DATA TAILORING

A. The LSA process objectives are established by program life-cycle phases and involve five general taskings as outlined in sections of the standard. These tasking sections provide the general purpose of each section, the individual tasks contained in each section, and the general purpose of each task and subtask. The sections provide for detailed analysis in the following areas:

Section 100	Program Planning and Control
Section 200	Mission and Support System Definition
Section 300	Preparation and Evaluation of Alternatives
Section 400	Determination of Logistics Support Resource Requirements
Section 500	Supportability Assessment

B. Individual tasks are divided into four parts: purpose, task description, task input, and task output. The purpose states the general reason for performing the task; the task description is comprised of detailed subtasks. The task input identifies the general information required to define the scope of each task and to perform each task. The task output identifies the expected results.

C. The requiring authority uses MIL-STD-1388-1A in the selection of tasks for inclusion in the SOW and establishes the LSA documentation requirements based upon the elements identified in the tasks. Applicable DIDs that describe the data to be generated by the contractor are shown in Table III of the standard. The DIDs are designed to provide a maximum range of data, but they can be tailored for individual programs. The following DIDs apply to selected major tasks:

Task	DID No.	Title
101	DI-L-7114	LSA Strategy Report
102	DI-L-7017A	LSA Plan
201	DI-S-7115	Use Study Report
203	DI-S-7116	Comparative Analysis Report
204	DI-S-7117	Technological Opportunities Report
402	DI-S-7118	Early Fielding Analysis Report
403	DI-S-7119	Post Production Support Plan
501	DI-S-7120	Supportability Assessment Plan
601	DI-S-7121	Supportability Assessment Report

D. Although LSA is to be initiated during the early phases of the life cycle, it is not until the Demonstration and Validation (DEM/VAL) phase that definitive tailoring begins. The analysis and documentation include equipment operation and maintenance levels down to subsystems and associated subassemblies and parts. At this point, system design and material support can still be influenced by the SPOs through contractual specifications.

E. Selection of some LSA tasks will result in data which are to be input directly into the LSAR. MIL-STD-1388-2A, Table II provides a list of those LSA tasks and subtasks which relate directly to the LSAR data records. The recording of the data elements is accomplished using the LSAR Data Selection Sheets (DD Forms 1949-1). The data selection sheets provide the requiring authority with a means for identifying to the performing activity the required LSAR data elements to be completed. Preparation of DD Form 1949-1 should be a result of the LSAR tailoring process. Thus, the preparation and maintenance of LSAR data are directly related to the hardware and software design of an end item. The requiring authority is in fact responsible for specifying the equipment indenture level and the level of maintenance for which the LSAR data will be prepared and maintained.

F. The LSAR provides a structured, standardized, yet flexible approach to the documentation and use of the data required to effectively accomplish LSA tasks.

1.5 AUTOMATED DATA SYSTEM - UNIFIED DATA BASE

A. The Logistics and Human Factors Division of the Air Force Human Resources Laboratory sponsored the development of the "UDB for Acquisition Logistics (UDB2000)." The UDB2000 is an advanced database management system that permits on-line interactive entry, retrieval, and analysis of LSAR information.

B. The UDB software is a powerful and sophisticated tool that integrates LSA-related information from various functional ILS areas. This integration provides users of the system with a central repository of related information intended to serve all functional LSA areas. The UDB2000 is fully compatible with the military standard requirements and provides enhancements beyond the standard. The system affords on-line data sheets/report screens and real-time calculations. The UDB2000 uses the Integrated Data Management System (IDMS) and the Integrated Data Dictionary (IDD). Thus, the capability exists to maintain relationships among data elements in the database and also provide a centralized dictionary in which to define and link together data elements, records, and files. Data are stored only once but are linked to all possible applications.

C. MIL-STD-1388-2A provides a Data Element Dictionary (DED) for the LSAR, and information for interpreting and using the LSAR. The dictionary contains all the data elements, acronyms, and abbreviations that appear on the LSAR data records. The dictionary is incorporated fully into the UDB2000.

1.6 SUMMARY

The overview provides insight to the LSA process and its application within the Department of Defense and civilian contractor community. The goal of MIL-STD-1388-1A is to institute a single, uniform approach for use by the Military Services in conducting those activities which will:

Ensure supportability requrirements become an integral part of system requirements and design;
define support requirements that are optimally related to system design and to each other;
define the required support during the operational phase; and
result in high-quality data products.

II. LSA/LSAR AND USAF TRAINING DEVELOPMENT

2.1 GENERAL

A. The LSA/LSAR processes described in MIL-STD-1388-1A and MIL-STD-1388-2A were evaluated for adequacy, effectiveness, viability, and applicability in training development. A review was conducted of the models/methodologies used by training functional managers to determine the extent of their application within SPOs.

B. The study focused on:

(1) Reviewing MIL-STD-1388-1A and MIL-STD-1388-2A for adequacy and completeness with respect to USAF training development needs.

(2) Evaluating the LSA process and completeness of the data elements in terms of their ability to meet training requirements.

(3) Identifying any new methods, procedures, or models which could improve training development in terms of effectiveness and timeliness.

(4) Evaluating the degree to which training information needs are satisfied by the current UDB and the UDB data elements.

(5) Identifying preliminary on-line data entry screens and output reports which appear to meet requirements for training information.

C. Based upon the above examinations where appropriate, recommendations were made concerning the automation of additional data elements for inclusion within the UDB2000; a means to incorporate additional data elements to existing on-line data entry screens; additional on-line query screens or output report formats to support general information requests; and specifications for changed or additional LSA tasking.

2.2 METHODOLOGY

A twofold review process was used to assess the current methods and data elements used in training development. First, Systems and Applied Sciences Corporation (SASC) revieved the LSA process, completeness of LSAR and LSAR data elements, and the present process of training requirement development. Second, the 3306 Test and Evaluation Squadron (TES) conducted a review and evaluation of current use and adequacy of MIL-STD-1388-1A and MIL-STD-1388-2A, and the adaptability of UDB2000, for training development application. The results were analyzed to determine how well the current LSAR and UDB development satisfied data requirements for ISD in particular. The findings of the 3306 TES and the above review are included in this paper.

2.3 TRAINING REQUIREMENTS - THE PROCESS

A. Early determination of training requirements has long been a goal of Air Force planners. It was not until 1973 that the Air Force Chief of Staff directed the application of the ISD process to all new weapon systems or major modifications under acquisition. To meet this objective, the Air Training Command (ATC), in 1973, performed an ISD pilot study on the B-1 aircraft pneudraulic system which determined that (a) test and evaluation maintenance data could be used for ISD, and (b) ISD could be used during acquisition to identify system maintenance training requirements and develop technical training material. Based on the results of the study, the 3306th TES was formed in May 1975, with the mission to support ATC's role in system acquisition, test, and evaluation through planning for system maintenance training, and identifying technical training material using the ISD process. The 3306 TES consists of a small cadre of experienced ISD subject-matter specialists located primarily at Edwards AFB, California. Their involvement with new systems usually begins on or about the time a prototype aircraft is sent to Edwards AFB for test and evaluation by the Air Force Operational Test and Evaluation Center (AFOTEC). At times, the 3306 TES also hosts ISD teams for systems not yet to the prototype state. In either case, individuals are assigned to an ISD team primarily based on their present assignment as technical instructors and their future assignment as instructors at Field Training Detachments (FTDs) for the operational units; however, they may be drawn from the technical school, FTD units, the using command, or other resources as necessary.

B. Training planning is a continuous process, and training development follows the same course as the development of the systems it will support. The process begins when Air Force Headquarters issues a Program Management Directive (PMD) directing the acquisition process through an established or to-be-established SPO. The PMD outlines responsibilities and general management objectives. Headquarters ATC appoints a single-point manager in the Directorate of Acquisition to manage its participation in the early stages of a weapon system. Also, ATC assigns a Responsible Test Agency (RTA), such as the 3306 TES. Thus, ATC is involved in planning training support for a new system from the inception of the system through the end of its operational life. ATC tasking includes defining training concepts, identifying training and training resource requirements, and

developing and implementing plans to meet the requirements. In this effort, a Test Participation Plan is developed in sufficient depth to ensure comprehensive management and application of the ISD process.

C. This process leads to creating a qualified ISD team trained in ISD procedures and knowledgeable in associated directives, technical orders, and military standards. The ISD team compiles an initial data base of system maintenance requirements obtained from the following sources:

(1) Using Command
(2) Contractor
(3) System Program Office
(4) Test Force
(5) Field Training Group
(6) Other

D. This effort starts the analysis of the database for identifying training requirements. ATC also reviews the Statement of Operational Need (SON) to ensure training considerations include the system's operational and support concepts. The using command is responsible for establishing the maintenance concept.

E. Once the data are collected and the maintenance concept established, the ISD team begins the ISD analysis using a 14-step adaptation of the standard Air Force ISD model. As necessary, ATC provides training specialists to the SPO to ensure that training development occurs in coordination with system development. The process is one of developing training programs in response to requirements identified by the SPO and the major using command.

F. The ATC Training Advisory Office to the Aeronautical Systems Division (ASD), Air Force Systems Command, plays an important role in defining the training requirements for the many SPOs. Although this office has limited manning, Training Support Managers are assigned to each ASD program. The level of effort will vary depending upon the program development stage. Initial effort could be high at the onset of planning and the subsequent program documentation development. The Advisory Office assists the SPO as a member of the Training Planning Team (TPT) and in the development and coordination of the Training Development Plan (TDP) under the guidance of AFR 50-8, Policy and Guidance for Instructional System Development (ISD).

G. The level of effort is directly related to the SPO emphasis on training-related issues. The ATC Advisory Office and their Training Support Managers stand ready to guide and/or work any training issues throughout the program life cycle. The following list shows those areas in which ATC assists the SPO in training planning for acquisition programs:

(1) Establishing a TPT and developing a TDP.

(2) Using the TDP as a basis for inputs to manpower, personnel, and training sections of the Program Management Plan (PMP), Inte-

grated Logistics Support Plan (ILSP), baseline, and other program decision documents.

(3) Ensuring a training equipment Source Selection Evaluation Board is conducted in-house or by the prime contractor. ATC contributes source selection criteria/standards.

(4) Initiating a Training Planning Information Document by contract to identify training and training equipment recommendations as outlined in DI-H-7066.

(5) Participating in Training Requirements Recommendation Review Meetings.

(6) Budgeting special training requirements.

H. The above planning and action areas are performed with and through the assistance of the ATC Training Support Manager assigned to work with the acquisition program.

I. The result is a training program which should ensure that maintenance personnel are qualified to perform their assigned duties. The completed training packages and training equipment will permit training to be performed by instructors of contractor schools, ATC resident technical schools, mobile training teams (MTTs), and unit-level technicians.

2.4 INSTRUCTIONAL SYSTEM DEVELOPMENT PROCESS

A. Since this paper concerns LSA, UDB2000, and training, it is appropriate to briefly describe the ISD procedures as applied by the 3306 TES. The 3306 TES currently uses a specially adapted version of ISD for the development of maintenance training and training equipment for new weapon systems, as described in the 3306 Procedural Handbook (January 1985). Their version of the Air Force five-step ISD model is divided into 14 procedural steps:

STEP 1 Identify System Maintenance Requirements

- gather data and identify all the duties and tasks related to the weapon system under development or modification.

STEP 2 Identify Characteristics of the Target Population

- analyze what students already know and what they are able to do now.

STEP 3 Determine Training Requirements

- determine what training requirements are needed for the known student population.

STEP 4 Determine Types of Technical Training Materials Required

- identify general classes of training media.

STEP 5 Develop Instructional Strategies

- sequence the tasks into logical lessons and blocks of instruction.

STEP 6 Identify Fidelity Requirements of Hardware Components

- determine the degree of realism required of each component to be included in the hardware trainer.

STEP 7 Select Instructional Features for Hardware Media

- identify features needed for hardware training if actual equipment will not be used.

STEP 8 Prepare an ISD-Derived Training Equipment Specification

- specify the numbers and type of trainers required, functional capabilities, component fidelity, and instructional features.

STEP 9 Identify Method of Instruction

- select the methods of instruction needed to accomplish each training requirement.

STEP 10 Prepare Course Control Documents

- prepare course/specialty training standards, course charts, plans of instruction, and other course documents.

STEP 11 Prepare Instructional Materials and Tests

- prepare all course materials and tests

STEP 12 Validate Instruction

- conduct a dry run of the entire training course

STEPS 13 and 14 Conduct and Evaluate Training

- continuing reevaluation during the life of the course is conducted by instructors and supervisors assigned to the technical training school or field training detachments.

B. ISD provides a systems approach for planning, developing, and managing a training program in support of a weapon system. The purpose here is not to expound on the process but to briefly highlight the relationship between this step-by-step procedure and LSA/LSAR. In this regard, Step 1 is of primary concern, since most often little or no hard data are available on the weapon system (or

major modification) in this early stage of the ISD process. Thus, in some cases, it is necessary for the 3306 TES to visit contractor facilities to compile the initial database. This entails time, money, and in-depth interviews with contractor engineers and technicians.

C. At this point, it is appropriate to show the "Model ISD Time-Line" used for planning purposes and usually applied when the first article delivery date, the Initial Operating Capability (IOC), is forecasted. Normally, 53 months are required to put trained maintenance personnel in place by first article delivery date (see Figure 1). In essence, a period in excess of 4 years is planned to more or less coincide with the system test and evaluation cycle.

D. The first 3 months of an ISD effort allow for selection of personnel resources and the collection of available data. The following 9 months are used to analyze the data for Technical Training Material (TTM) recommendations. In turn, the requirements are reviewed by Headquarters ATC in the Training Requirements Recommendation Review Meeting (TRRRM). Although not a formal ISD step, the approved TRRRM package provides the SPO with those TTM items requiring funding and procurement action.

E. It is important to note that the whole process could be less than effective if adequate data, both in quantity and quality, cannot be obtained in the early stage. LSAR under MIL-STD-1388-2A becomes a vital data source if applied during the Integrated Logistics Support Planning, the LSA, and the ISD efforts.

2.5 LOGISTICS SUPPORT ANALYSIS PROCESS

A. The LSA process can be divided into two parts: (a) the analysis of supportability, and (b) the assessment and verification of supportability. The first part starts at system level within the design and operational concepts and, after processing through the various analysis considerations, moves to a lower level of indenture. Subsequent lower-level analyses then define the logistics support resources requirements through the integrated analysis of operator and maintenance functions and tasks; these analyses address task frequencies, task times, personnel and skill requirements, supply support, and other needs. The second part concerns the system or equipment life cycle performance and adjustments thereto.

B. MIL-STD-1388-2A outlines LSA requirements down to the subtask level, since this level of detail is needed to adapt them to specific acquisition programs and specific phases. The level of detail selected and the timing of task performance should be tailored to each system or equipment. The military standard provides a general tailoring decision logic tree to be followed in task selection.

C. In essence, a productive but cost-effective LSA effort must concentrate available resources on those activities which are most beneficial. This calls for selection of those tasks and subtasks which can be adjusted based on considerations listed in MIL-STD-1388-2A. These considerations consist of:

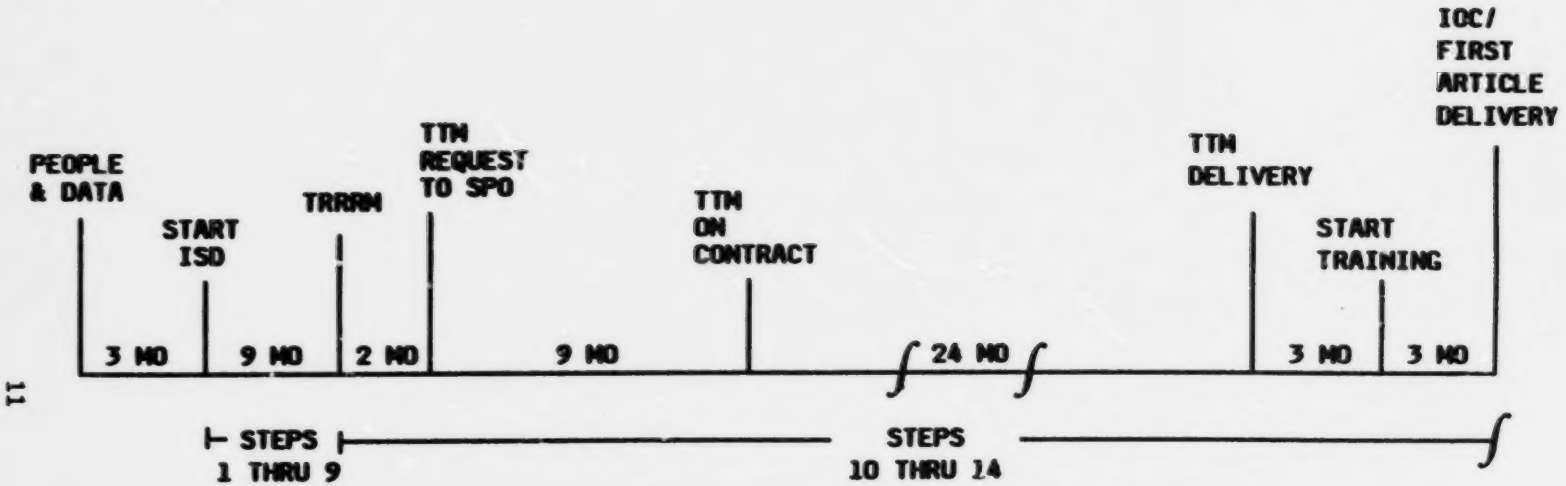

Figure 1. Model ISD Time-Line

Source: Procedural Handbook, 3306 TES, January 1985

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(1) Amount of design freedom
(2) Time phasing adjustments (fast track programs)
(3) Work already done
(4) Data availability and relevancy
(5) Time and resource availability
(6) Policy directive information needs
(7) Desired tasks not in the standard
(8) Procurement considerations

These factors are discussed in detail within the military standard and will be discussed only in part here.

D. Work already done, data availability and relevancy, and procurement considerations all play a key role in the use of LSAR for training requirements. The collection process at best must take advantage of past experience and historical data. Available databases must be revieved for relevancy, and the SPO must decide and specify the LSA tasks for contractor or Government performance. Thus, the request for proposal (RFP) becomes the key to what LSA data the training function can expect, and what degree of importance the SPO places on needed documentation. The LSAR is, in fact, a subset of LSA documentation, and delivery of LSAR data should be specified in the contract data requirements list (CDRL, DD Form 1423).

E. MIL-STD-1388-2A prescribes the use of LSAR data selection sheets (DD Form 1949-1) as the means of identifying the required LSAR data elements. Preparation of the data sheets is the result of the LSAR tailoring process discussed above.

2.6 LSAR DATA

LSAR data are usually prepared by the contractor. However as previously stated, the 3306 TES has assisted in specific data development at contractor's facilities. In any event, the LSAR data are directly related to the hardware and software design of the end item being procured. The LSAR data may be prepared and maintained manually or by data automation, or by a combination of methods. Use of an automated ADP system requires validation by the Joint-Service office at MRSA. Currently, a Joint-Service LSAR ADP system may be used for LSAR data, or the Services may use their own unique systems for internal processing of LSAR data.

2.7 DATA ELEMENT DEFINITIONS

To provide a better understanding of the LSAR process, the folloving definitions are supplied. These definitions all relate to data elements that appear on the LSAR data records. The LSAR data elements are standard, as prescribed by the military standard. A supplemental listing of Data Elements was prepared during UDB2000 development.

(1) Data Element:

Technical data required to support an integrated logistic support program. These data are standardized using LSAR data element definitions.

(2) Data Element Definition (DED):

A narrative definition of the Data Element in sufficient detail to present a clear and complete understanding of the precise data or element of information that the data element represents.

(3) Data Element Definition (DED) Number:

A sequentially assigned number given to each data element in the dictionary for use in locating and referencing the element throughout the dictionary and data entry instructions (see MIL-STD-1388-2A, Appendix A).

(4) Data Element Title:

The noun phrase name used to identify the data element. Sufficient adjectives/modifiers are used with the noun name to ensure title uniqueness.

(5) Data Item:

One of a set of descriptive items of information or values that applies to a data element (e.g., the data element "Skill Level Code" contains the data items "Basic," "Intermediate," and "Advanced").

(6) Data Code:

One or more alphabetical, numerical, or special characters that represent data items that are to be entered in a field on an LSAR data record; e.g.,

Data Element - "Update Code"
Data Items - "A" - addition; "C" - change;
"D" - deletion

(7) Data Item Description (DID):

A form (DD Form 1664) used to define and describe the data required to be furnished by the contractor (provided to contractors for identification of each data item listed on the CDRL); e.g.,

DI-H-3258A "Training Support Data LSAR Application" use B, D, D1, E, E1 and G data records.

2.8 LSAR DATA RECORDS

A. At present, the series of LSAR data records contained in MIL-STD-1388-2A consists of records A through J. The LSAR is a standardized process for systematically recording, storing, processing, and displaying system and equipment analysis data. Input data are prepared by the performing activity in accordance with the standard. Note that all LSAR data refer to individual "end items" of equipment which are referenced by work unit codes and nomenclature. The following LSAR data records are part of the Joint-Service LSAR ADP system:

(1)	A Record	Operation and Maintenance Requirements
(2)	*B Record	Item Reliability (R) and Maintainability (M) Characteristics
(3)	B1 Record	Failure Modes and Effects Analysis
(4)	B2 Record	Criticality and Maintainability Analysis
(5)	*C Record	Operation and Maintenance Task Summary
(6)	*D Record	Operation and Maintenance Task Analysis
(7)	*D1 Record	Personnel and Support Requirements
(8)	*E and E1 Record	Support Equipment or Training Material Description and Justification
(9)	E2 Record	Unit Under Test Description and Justification
(10)	F Record	Facility Description and Justification
(11)	*G Record	Skill Evaluation and Justification
(12)	H Record	Support Items Identification
(13)	H1 Record	Support Items Identification (Application-Related)
(14)	J Record	Transportability Engineering Characteristics

* Has implications for training development requirements

B. Source documentation is usually done by the prime contractor according to MIL-STD-1388-2A, and any revised input data record formats or data element definitions must be approved by the requiring authority during contract negotiation. In this manner, LSAR data are generated as a result of the analysis tasks outlined in MIL-STD-1388-1A. LSAR data become the ILS technical database to support material acquisition programs.

C. The following descriptions are abstracted, in part, from the military standard in order to highlight the purpose of selected individual data records:

(1) Data Record A: "Operation and Maintenance Requirements." Prepared for the system and for each subsystem for which maintenance requirements are to be imposed; it is also prepared for Government-furnished equipment. The record documents system maintenance requirements and further documents the allocation of those requirements to lover indenture repairables. Record A data are provided by the Government activity and may be included in the solicitation.

(2) Data Record B: "Item Reliability (R) and Maintainability (M) Characteristics." This record describes the functions of the end item, outlines the maintenance concept to be utilized for

design and support planning purposes, and identifies any design conditions such as fail-safe requirements and/or environmental or nuclear hardness considerations imposed upon the system. The record summarizes the reliability, maintainability, and related availability characteristics of the item resulting from the failure modes and effects, criticality, and maintainability analyses documented on the B1 and B2 Data Records. A separate B record is prepared for the system, for each subsystem contained in the system, and for each lower level for that subsystem until the lowest reparable item has been documented. The degree of breakdown shall be specified by the requiring authority.

(3) Data Record C: "Operation and Maintenance Task Summary." The Operation and Maintenance Task Summary record is used to consolidate the operations and maintenance tasks identified for each reparable assembly and indicates necessary support requirements (e.g., facilities, training equipment, tools, and support equipment). Detailed analyses of the tasks identified on the C Records are provided on the D Records. C Data Records are completed to the same indenture level as the B Data Records.

(4) Data Record D: "Operation and Maintenance Task Analysis." The D Data Record provides a detailed step-by-step narrative description of how tasks identified on the C Record are to be performed, the specific Air Force specialty (AFS) and skill level recommended, and applicable task times (manhours and elapsed time). Data on the D Record provide information necessary for the development of technical publications and personnel requirements. The D Record data will be initiated during detailed system/equipment design. For all operational and maintenance-level tasks, specific requirements for the completion of the D Record, hardware items, and indenture levels will be as specified by the requiring authority. D Data Records are completed for each task documented on Data Record C.

(5) Data Record D1: "Personnel and Support Requirements." The D1 Data Record provides recommended training, personnel, support equipment, and supply support requirements necessary for the accomplishment of the individual tasks described on Data Record D. During the detailed system/equipment design, the data record will be initiated for each task identified on Data Record C. Man-hours and elapsed time are also recorded on the Data Record D1.

(6) Data Record E: "Support Equipment or Training Material Description and Justification." Unless otherwise specified, this data record is structured to consolidate the pertinent information related to existing or new support/test equipment or training material. The E Data Record serves as identification of and justification for all hardware and software elements required to conduct off-line test.

2.9 LSAR REPORTS

A. A large number of reports are available through the Joint-Service LSAR ADP program and will also be available using the UDB2000 system. These reports comprise one of the principal benefits of the LSA/LSAR process and should be of much use to the training communities. Some examples of reports deemed helpful in training development, and their related DIDs, are listed below. Additional DIDs for training purposes are listed in paragraph 3.5(J) of this report.

Report number	Report title	DID number
LSA-001	Direct Annual Maintenance Man-hours by Skill Specialty Code and Level of Maintenance	DI-L-7146
LSA-002	Personnel and Skill Summary	DI-L-7147
LSA-011	Requirements for Special Training Device	DI-L-7155
LSA-014	Training Task List	DI-L-7158
LSA-015	Sequential Task Description	DI-ILSS-80115
LSA-022	Referenced Task List	DI-L-7163
LSA-075	LSAR Manpower Personnel Integration (MANPRINT) Summary	DI-ILSS-80290

B. The Training Task List report, which lists tasks by Air Force specialty code (AFSC), is used exclusively for training purposes. The report can be used to recommend tasks for training and provide a basis for recommending training locations.

C. To show the relationships among the LSAR data records, the LSAR reports, and Data Item Descriptions, a flow diagram is presented as Figure 2. This diagram depicts the use of selected LSAR records, containing data elements which are formatted in numbered LSAR reports. These reports contain key information for the manpower, personnel, and training (MPT) community.

D. New reports are being developed as a result of Service recommendations to the Joint Service LSA Working Group, which is chaired by the Army Materiel Readiness Support Activity (MRSA) at Lexington, Kentucky.

III. STUDY REVIEW AND FINDINGS

3.1 APPROACH

A. The study effort encompassed a thorough examination of the available methods for determining training needs and training models, and other

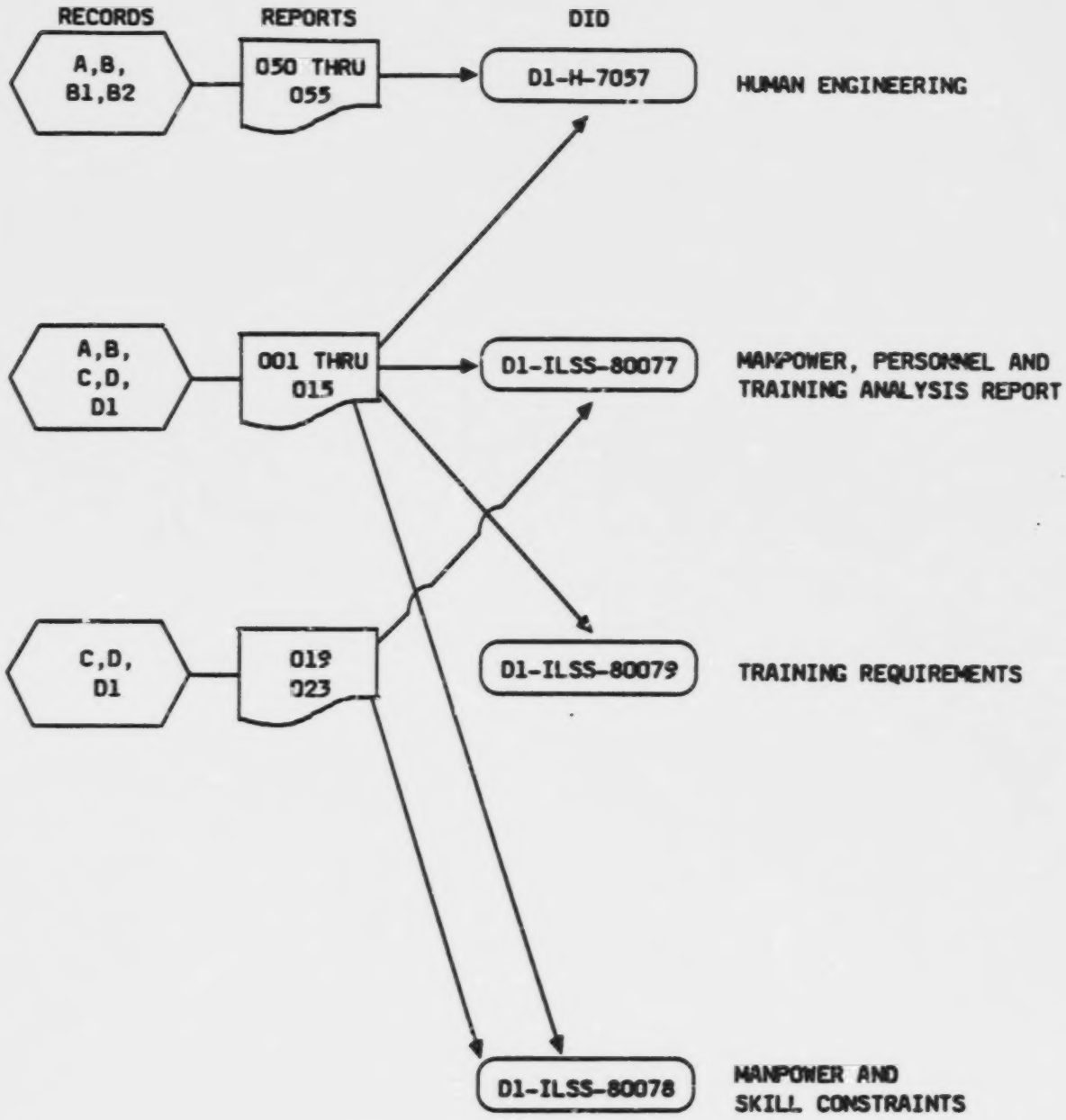

Figure 2. LSAR Data Flow for MPT

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methods and procedures used within the training area in system acquisition. An assessment was made of the standard contract data items referenced by MIL-STD-1388-2A used in training development. In addition to a literature review, this process involved discussions with various offices which included SPOs, ASD, Air Force Acquisition Logistics Center (AFALC), ATC, and selected contractors. Also, an evaluation was conducted at our request by the 3306 TES. The review also focused on the ISD process and the application of the UDB for training during system acquisition.

B. Useful and supplemental data elements in the military standard were reviewed; and data elements required to produce any new LSAR data records for training requirements were to be defined. An evaluation of the procedures for handling the data within the UDB2000 was made.

3.2 MODELS/METHODS IN USE

A. ISD is the required process for developing Air Force training, as defined in AFR 50-8. It is a model of five broad steps that will be used for decision making regarding education and training programs needed for a new weapon or support system. The requirement, then, must start during the conceptual development stage and continue throughout the life of the system. The process also calls for responsible offices to match anticipated instructional requirements with needs and thus develop budget proposals for instructional programs. An interface between the Planning, Programming and Budgeting System (PPBS) and the ISD process to fulfill these requirements is also needed.

B. In addition to the applicability of ISD for acquisition programs, AFR 50-8 also mandates the process for:

(1) Air Force educational programs (i.e., professional development, management, and leadership courses).

(2) Existing education and training programs.

(3) Training associated with an Air Force specialty or system (e.g., OJT, correspondence training, and aircrew training).

C. The 3306 TES has developed a 14-step adaptation of the Air Force five 5-step ISD model. Their procedure provides an orderly process for planning and developing training and training equipment requirements. A comparison of the 3306 TES model to the Air Force model is shown in Figure 3.

3.3 INTERFACE OF ORGANIZATIONS

A. A number of organizations interact in the acquisition process. The Program Manager (PM) in the SPO is the key individual, being responsible for the overall management and ensuring of communication and coordination of goals among all participants. SPO management coordinates the activities of the using major command (MAJCOM), Air

AFM 50-2

STEP	PROCEDURE
I	ANALYZE SYSTEM REQUIREMENTS
II	DEFINE EDUCATION/ TRAINING REQUIREMENTS
III	DEVELOP OBJECTIVES AND TESTS
IV	PLAN, DEVELOP AND VALIDATE INSTRUCTION
V	CONDUCT AND EVALUATE INSTRUCTION

3306 TES

STEP	PROCEDURE
1	IDENTIFY MAINTENANCE REQUIREMENTS
2	IDENTIFY TARGET POPULATION
3	DETERMINE TRAINING REQUIREMENTS
4	DETERMINE TRAINING MATERIAL
5	DEVELOP INSTRUCTIONAL STRATEGIES
6	IDENTIFY FIDELITY REQUIREMENTS
7	SELECT INSTRUCTIONAL FEATURES
8	PREPARE TRAINING EQUIPMENT SPECIFICATION
9	IDENTIFY METHOD OF INSTRUCTION
10	PREPARE COURSE CONTROL DOCUMENTS
11	PREPARE INSTRUCTIONAL MATERIALS AND TESTS
12	VALIDATE INSTRUCTION
13	CONDUCT TRAINING
14	EVALUATE TRAINING

Figure 3. ISD Model

Source: Procedural Handbook, 33-6 TES, January 1984

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Force Logistics Command (AFLC), AFALC, AFOTEC, and ATC. The PM is responsible for consolidating and issuing all documentation, to include the Program Review Package (PRP), Integrated Logistics Support Plan (ILSP), and the Integrated Support Plan (ISP). The SPO also has the overall responsibility for carrying out the training development program necessary to support its acquisition program.

B. Although the SPO handles the day-to-day management of the weapon system and its support elements to include the procurement of maintenance training devices, the Simulator SPO (SIMSPO) currently manages the development and acquisition of aircrew training devices. A working agreement is usually reached between the two SPOs to define the specific tasks and responsibilities of each. Thus, the SIMSPO assumes a role somewhat parallel to the weapon SPO in that the activities of cost, schedule, budget, inputs to RFP, etc., must be completed along with the weapon system schedule. In essence, the SIMSPO role has been to develop and ensure delivery of the needed aircrew training devices.

C. The interface continues with the selection of the Deputy Program Manager for Logistics (DPML) or the Integrated Logistics Support Manager (ILSM) for the development and use of the ILSP. For a less-than-major acquisition program, the ISLM performs a similar role to that of the DPML. The ILSP, when developed, sets the stage for a manageable program that will integrate program planning, engineering, design, test and evaluation, production, and, finally, operation of the system. Support for training development is provided to the SPO by AFALC in the form of requirements review for the SOW and RFP. Thus, AFALC reviews program documentation to ensure that training considerations are included along with manpower and personnel requirements in contractor taskings.

D. The using MAJCOM is tied to the process in that it provides qualified personnel needed to support the ILS planning through implementation of policies and procedures. The using command must also provide and update the operational and maintenance concepts as the acquisition program moves along. Their involvement in the training development effort begins with their recommendations of AFSCs and the tasks to be applied. In some cases (e.g., a major program), the using command may assign an analyst to work temporarily with the SPO on training development. However, this is the exception; usually a SPO member is assigned this duty.

Although ATC is involved in planning of training support for a new weapon system from the initial SOW through the end of the system's operational life, the SPO is responsible for and initiates training development planning. This is accomplished through the establishment of the TPT and the subsequent creation of a TDP. The SPO focal point usually chairs the TPT meetings. These meetings are attended by a multicommand staff of people who have the responsibility for planning the training requirements for the life of the weapon system. The plan should address all the training needs, schedules, AFSCs, issues, etc. for a total training program. The plan is prepared under the provisions of AFR 50-8 and AFR 50-11, usually concurrently with the system

design review or shortly after Full-Scale Development (FSD) begins. Thus, the TDP is currently not a timely document in the acquisition process. Development of the TDP is a very important event. ATC may provide trained specialists to the SPO as management deems necessary, and as is consistent with the role and evaluation of the ATC Training Advisory Office at the AFSC Division level.

HQ ATC is a key organization in the development of maintenance training, and they must ensure the establishment of policy and directives to this end. Maintenance training system development is usually assigned to one of the Technical Training Centers (TTCs) or to the TES. HQ ATC also manages the efforts of Field Training Detachment (FTD) personnel regarding course instruction and use of the training devices. The TTC has the responsibility of planning, instructor staffing, and curriculum development of their respective resident maintenance training courses. In addition, they may be tasked to assist in the ISD process and in the training system development and design reviews. TTC personnel must also be involved with the using MAJCOM's maintenance and training personnel to gain an understanding of the weapon system maintenance concept in use.

E. The Air Force has recognized the need for increased emphasis on MPT requirements earlier in the weapon system acquisition process. Toward this end, an MPT Directorate has been established within the Aeronautical Systems Division, Deputy for Acquisition Logistics (ASD/AL). Better analysis and integration of MPT requirements within the program offices are anticipated. This directorate will serve an extremely important role in formalizing all MPT activities within the SPOs. At present, training requirements development lacks the needed direction to ensure that all necessary events are planned for and controlled. Individual SPOs are not always consistent or thorough in their efforts to ensure that needed training and training devices are available in time to meet IOC. This is said not to fault any individuals or managers but rather, to point out the previous lack of a central responsible body with the resources needed to enhance and ensure a compatible effort within the program office.

The new MPT Directorate will develop this needed capability. MPT analysts will be available to advise, assist, and provide such services and/or information as technical information, analytical models, and information systems. In addition, maximum use can be made of existing methods and models; for example LSA, LSAR records and reports, and Logistics Composite Model (LCOM) and other model products can become established media for all program offices. It is important to note here, that the purpose of MPT analysis and integration is to quantify MPT impacts on individual weapon systems, both current and planned. Thus, a means exists for adopting new procedures or systems from which individual SPOs have benefited in working with their prime contractors or subcontractors. An example is the McDonnell Aircraft Company's CLASS system for providing LSAR records and data. The F-15E and C-17 SPOs were able to establish terminal hook-up with McDonnell Aircraft Company and McDonnell Douglas Corporation to enhance the receipt of needed data elements.

MPT personnel will have visibility across programs, and the capability to support SPO objectives, especially during initial or high workload events, such as front-end analysis, SOW and RFP preparation, and program review. The MPT Directorate will have the following responsibilities:

Ensuring MPT analysis and integration along with system development in acquisition programs.

Establishing a structured process for accomplishment of MPT tasks on acquisition programs, including application of uniform procedures and standards for MPT analysis and integration.

Establishing an MPT decision support system which includes life-cycle cost and cost-effectiveness data bases and models.

Ensuring that program management responsibility transfer and planning for fielding of the system address MPT.

Establishing a process to ensure that program reviews include assessment of MPT issues and concerns.

Finally, the MPT Directorate will work on developing a contractual language that will ensure that MPT requirements are thoroughly included and evaluated in the source selection process.

In effect, the newest member of the interfacing organizations will provide increased emphasis and direction upon the integration of MPT elements into the weapon system acquisition process. This is an important development for ensuring that the training, planning, requirements analysis, and training equipment development and production are effectively planned, coordinated, and funded for each new or planned system.

F. Figure 4 provides a graphic representation of the organizational interfaces. The lines linking organizations involved in training development need not be considered limiting in terms of communication and coordination. Also, it should be noted that though the PM has management responsibility for ISD application, it is the responsibility of the 3306 TES or contractor to apply the ISD process.

3.4 CASE STUDY OF F-15 TRAINING DEVELOPMENT

A. The process of an ISD effort changes over the life of a weapon system. An example is the F-15 aircraft, whose initial ISD was done by test and evaluation personnel and selected FTD instructors using an elementary ISD process current at that time. This ISD team identified the courses required to maintain the F-15, and those Type 1 training courses specified by the team and the initial test team at Edwards AFB. This effort provided the FTD courses necessary to establish an in-house capability to train F-15 maintenance personnel. During this same period, the ISD process also identified the needed maintenance training devices.

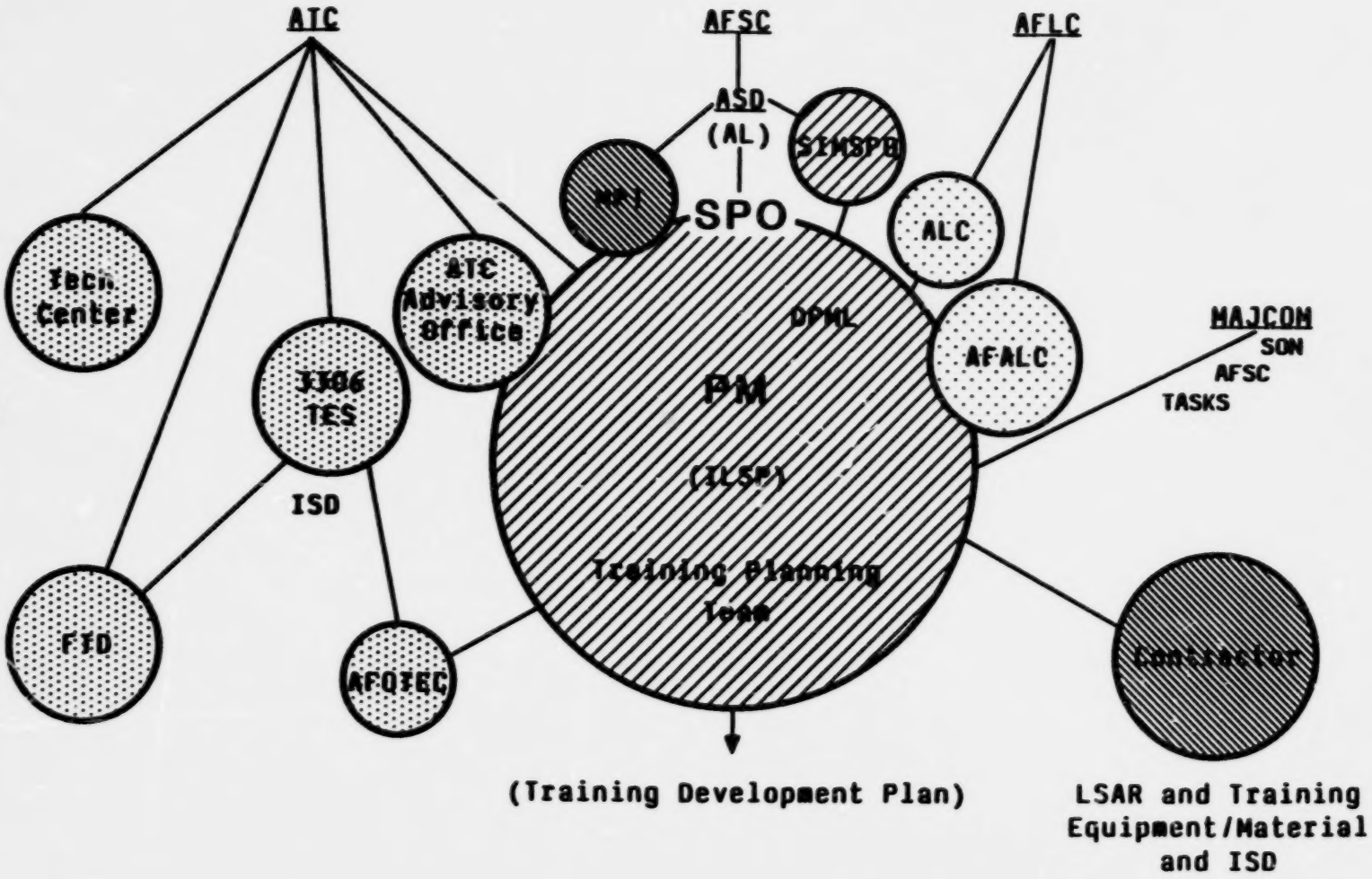

Figure 4. Training Development in Acquisition

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B. In the following years, as the F-15 evolved and new courses were required, the ISD was performed by the FTD responsible for developing the courses. In this manner, ISD responsibility shifted from test and evaluation personnel to field training personnel and finally to the appropriate TTC responsible for teaching the resident course.

C. The current TDP, Annex 1 F-15E, does not require a new ISD process since the E-model is a derivative of the basic aircraft. Thus, current maintenance training courses are to be reviewed and updated to reflect changes required by the new configuration. Aircraft Maintenance Training (AMT) and Mechanical Trainers (i.e., hardware system trainers and systems equipment groups) are to be provided. These will be developed based upon the LSAR data and Task Analysis performed under contract in compliance with MIL-STD-1388-2A. Under direction of the SPO, training development will include:

Aircraft Maintenance Trainers - computer-controlled simulation systems that provide organizational-level training on specified procedures for fault isolation, adjustment, and remove and replace maintenance actions.

Mechanical Trainers - hands-on training devices using actual aircraft hardware and ground support equipment to train maintenance personnel in a controlled environment. They will be used to teach system operation, component location, troubleshooting, rigging, and remove and replace procedures.

Type 1 Maintenance Training - Type 1 training is formal training conducted by contractors under AFR 50-9 and can be conducted at the contractor's location or at an Air Force Base. Projected training includes courses for:

AFSC 326x6	Integrated Avionics Attack Control Systems	3-week course
AFSC 326x7	Integrated Avionics Instrument and Flight Control Systems	2-week course
AFSC 326x8	Integrated Avionics, Communications, Navigation, and Penetration Aids Systems	3-week course
AFSC 42371	Aircraft Environmental Systems	1-week course
AFSC 43171	Tactical Aircraft Maintenance	8-day course
AFSC 46270	Aircraft Armament Systems	3-week course

D. It is appropriate to briefly mention training equipment acquisition. The needed maintenance training equipment includes the aircraft maintenance trainers, mechanical trainers, and other devices used for in-residence training and for mobile training given at base level. Requirement identification is the responsibility of ATC, and, when

known, is provided to the SPO for funding action. After equipment delivery to ATC, the program responsibility is transferred to the proper Air Logistics Center (ALC). The ALC provides logistics support for the equipment in terms of funding and procuring replenishment spares and repair parts, and also through the provisioning for initial spares, repair parts and support equipment in time to meet training milestones.

E. Under the basic F-15 TDP, ASD and the SPO provide overall management for the acquisition and integration of the training requirements. Planning and control are accomplished through the TPT, who establishes and maintains program training goals. Training plan progress is reviewed at quarterly ILS Management Team reviews conducted by the SPO. Any program redirections are evaluated in terms of training requirement impact. ATC is responsible for a major part of the overall training acquisition as the basic F-15 TDP states that ATC will:

Identify the training devices and participate in TPT decisions.

Conduct and manage the maintenance ISD analysis to provide needed information to ASD and the user command.

Act as the sole procurement activity for all Type I, formal contractor training.

Participate in specification reviews, RFP preparation, source selection, preliminary and critical design reviews, acceptance testing, technical order reviews and verifications, and maintainability demonstrations.

Provide formal Air Force maintenance training.

F. Training development in acquisition is an approach to provide for a complete training system, including the needed trainers, training devices and technical materials required to conduct all training. The F-15 TDP and the associated F-15E annex plans are viable documents outlining the training concept and training responsibilities. This is a result of the combination of the individual planning efforts of all the interfacing organizations.

G. Although these plans point to the use of the ISD process in training development, they make no reference to the application of LSAR data under MIL-STD-1388-2A. Training planning should include the requirement for LSA tasking and the subsequent LSAR tailoring process. This may well be contained in the ILSP; however, the Statement of Operational Need, Program Management Directive, maintenance concept, schedules, etc. must relate to training development in the form of data requirements. In that the LSAR data are directly tied to the end item being procured, so lies the need for proper selection of data elements. The TDP should be expanded to capture, as a minimum, those DIDs for training data required to be furnished by the contractors.

3.5 CONTRACT TRAINING DEVELOPMENT

A. Whether determination of training needs is done in-house or by contract, training requirements are always determined through an analysis of tasks necessary to complete a job action. Tasks, then, must be stated in terms of what students must be able to accomplish as a direct result of the training experience. This action forms the basic starting point in developing training courses and equipment training devices.

B. The present investigation identified three approaches to training development currently in use.

Use of a generic approach based on similar program tasks, steps, and skills/knowledge listings.

Contractual development of tasks, steps, and skills/knowledge based on engineering data, with tailoring by training specialists.

In-house development by trained ISD personnel of task, steps, and skills/knowledge based upon generic listings, LSAR data, or other contractor furnished data.

It should be noted that seldom are any of these databases complete. Thus, subject-matter specialists (SMSs) must work with contractor design personnel, engineering drawings, available LSAR data, and other existing technical data to develop the tasks and subtasks (see Figure 5).

C. The B-1B SPO initiated a contract to develop an analysis of the necessary weapons release system and weapons loading training required at the organizational level to meet the goals of the B-1B armament system technical training program. Contractor analysts began their effort by defining the basic jobs and duties anticipated on the B-1B aircraft for AFSC 462X0, Armament System Technician. They developed a job list which contained nearly 500 tasks in the two job areas of weapons loader and release system technician. They worked with Air Force SMSs to complete an initial task list. The analysts examined all tasks; grouped them by common elements of skills, components, etc.; and made recommendations under an established training concept. This training concept centered around the delivery of the training, the philosophy about the training structure (e.g., instructional goals, objectives, integration of media and training hardware, etc.), and the training environment.

D. The analysis process was also based on the concepts in AFM 50-2 and AFP 50-58 as expanded and modified by the AFHRL Maintenance Trainer Design and Acquisition Handbook of ISD Procedures for Design and Documentation. A computer application was used to control and manage the process and gained the benefits of:

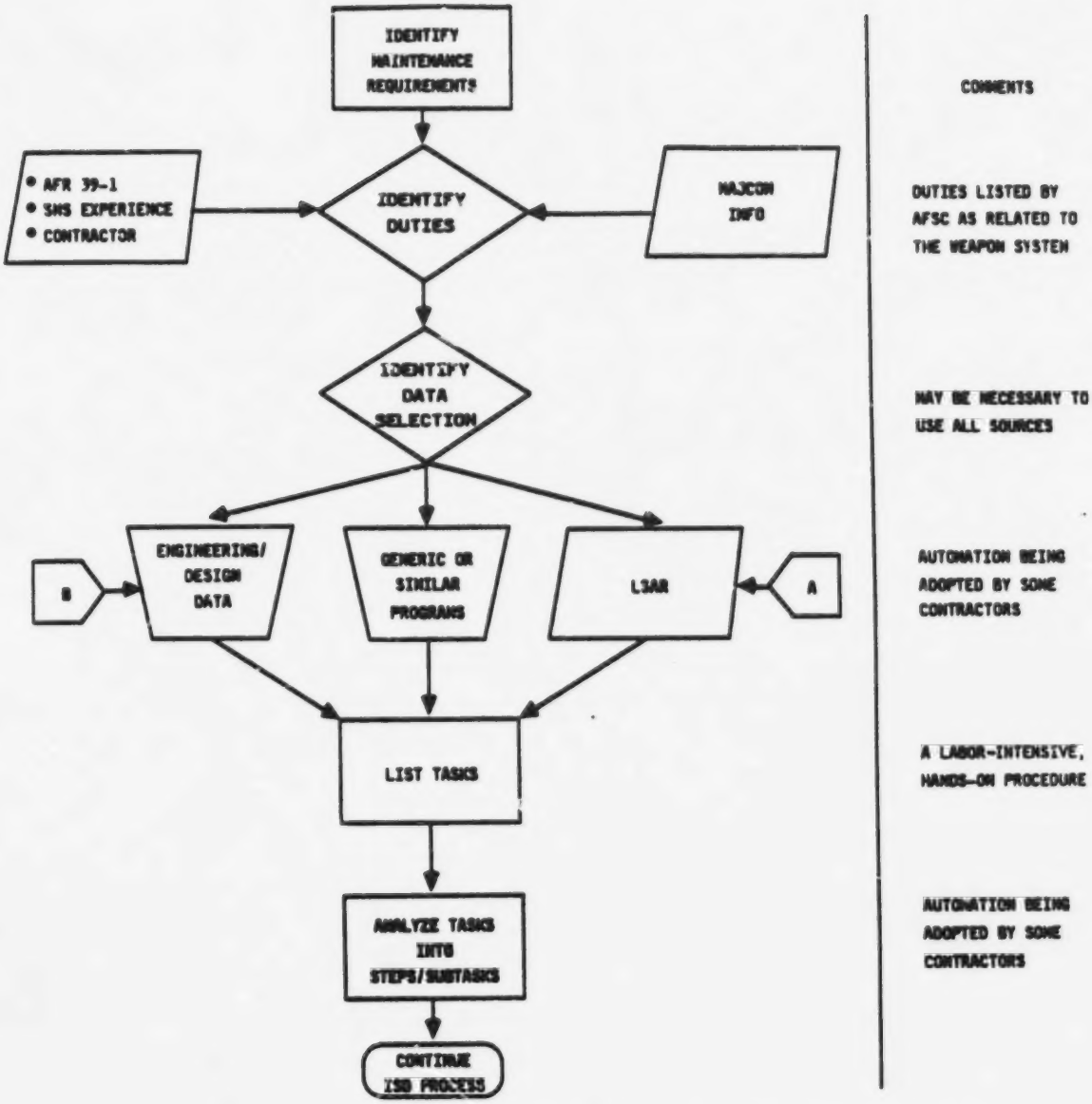

Figure 5. ISD Training Analysis - Present Procedure (Page 1)

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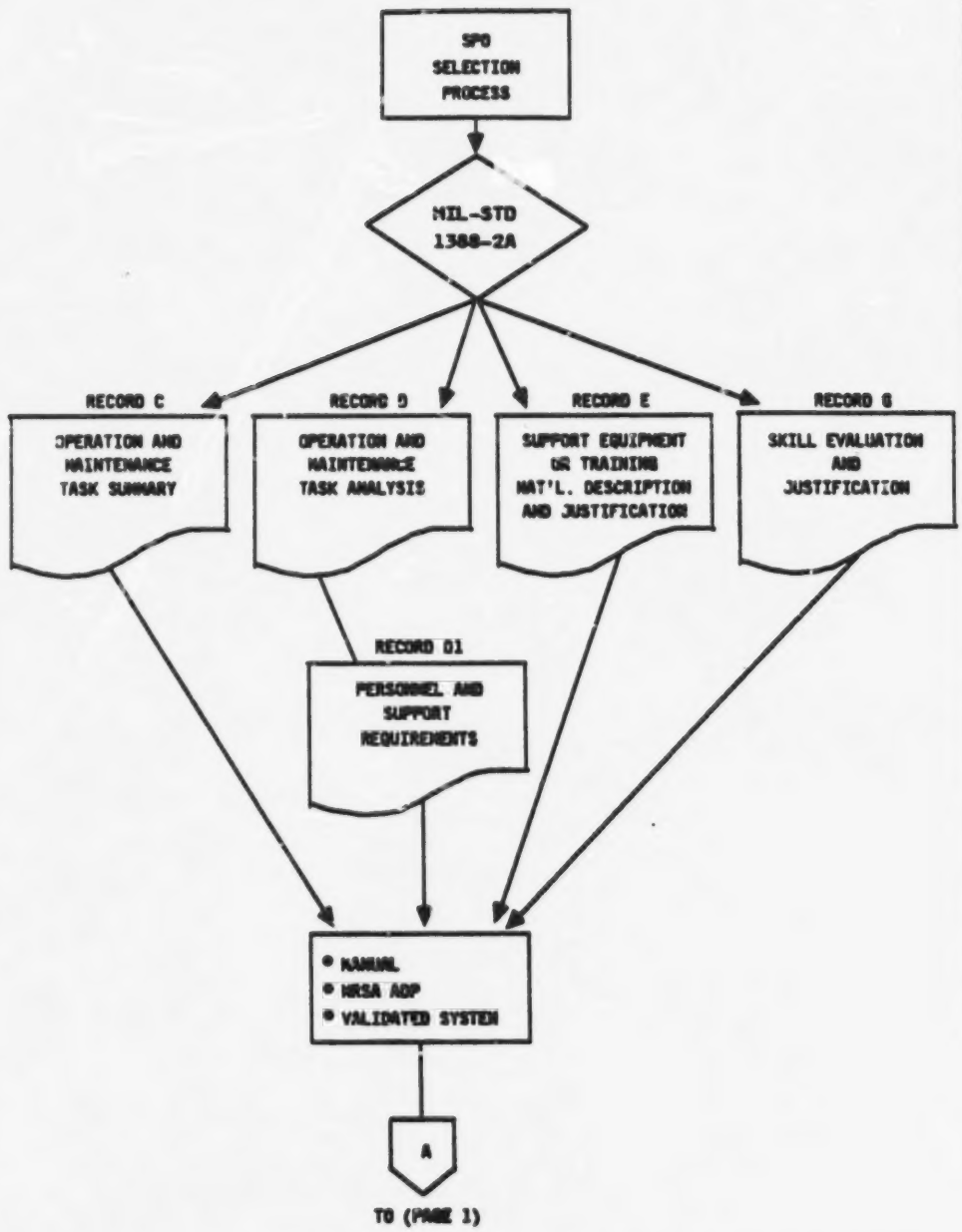

Figure 5. LSAR Input to ISD (Page 2)

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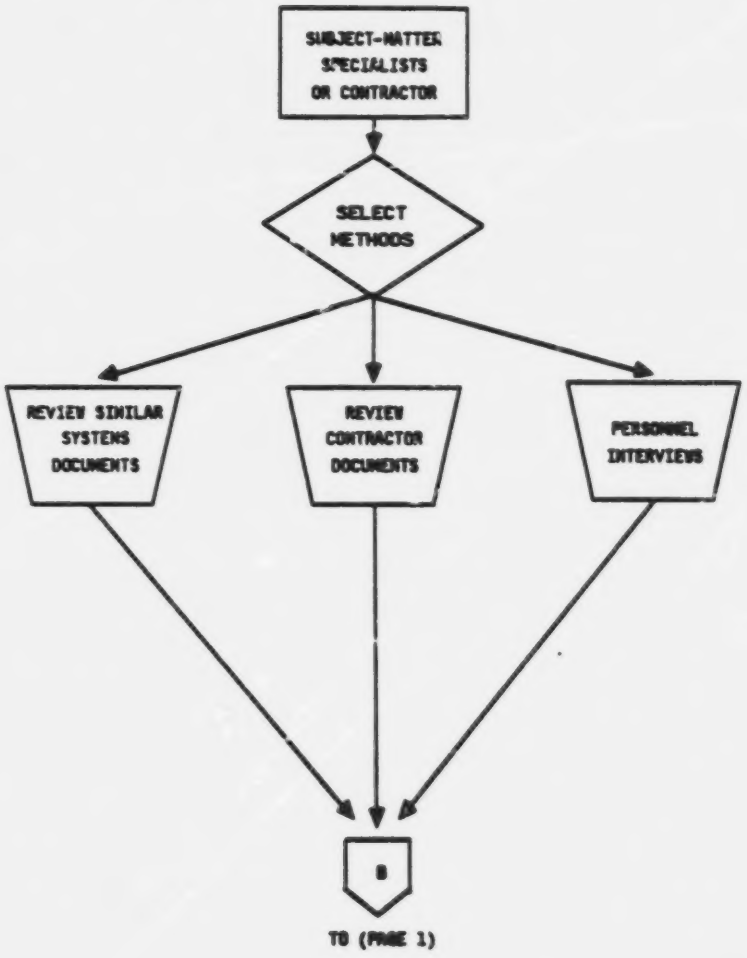

Figure 5. Other Data Input to ISD (Page 3)

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Reduction in analysis time,

Tracking of relationships of tasks, steps/activities, and skills/knowledge,

Ease of formatting results,

Separating of hardware from non-hardware tasks, and

Developing the training device requirements.

E. This process yielded a training device requirement or required training system description for each task or task grouping, and served to provide the initial design of the needed training device. The final design was completed through a review by the contractor and Air Force SMEs and managers.

F. The decision on training requirements under the above process or other ISD processes is not based on a model, but upon the collective judgment of technicians, analysts, and managers.

G. MIL-STD-1379B also provides guidance for training course development under contractual agreement. The development process requires the contractor to use an ISD event-sequencing method. Further, the standard explicitly requires that a training conference be held within 60 days after contract start date. It is intended that the contractor present a detailed training program plan using LSAR data, engineering drawings, and other available data to define and support the training outline. This review serves both Government and contract personnel as a means to refine and agree upon detailed training requirements. Formal minutes are prepared by the contractor to record all decisions and agreements.

H. Appendix A of the standard lists applicable DIDs for training data which may be placed on CDRLs as needed. This standard is not intended to duplicate other efforts, as data developed under other contract requirements should be utilized to fulfill needs.

I. The Manpower, Personnel and Training Analysis Report, DI-ILSS-80077, illustrates the use of data directly from LSAR for training purposes. Under a total LSAR program, data elements, including codes and definitions, should be available to complete this report. For those acquisition programs not on contract for a total LSA program, generation of data will be limited to those elements of data unique to the DID. The standard also states that duplicate effort is prohibited for the development of data applicable to two or more DIDs. DI-ILSS-80077 is designed to show the technical tasks performed by operator and maintenance personnel, job descriptions, and manpower requirements necessary for the proper operation, maintenance, and repair of system and equipment. The report lists skills needed, frequency of task performance, time required to perform tasks, personnel requirements, and location and description of task steps. This DID should be applied to Development/Production-phase contracts.

Completion of the DID will provide the program office detail within the following areas:

System and equipment introduction and description, providing information relevant to the operational and maintenance concepts.

Job task analysis summary, providing a description of each task needed to operate and maintain the system and equipment, and the related personnel data requirements.

Job training task list, providing a breakout of the task behavioral elements, conditions under which the tasks must be performed, task performance standards, and tasks for which training is to be provided.

Manpower planning data, providing the number of personnel required to operate and maintain the system and equipment.

Manpower summary, listing the operator and maintenance quantitative manpower requirements, by personnel specialties and skill levels required to perform the tasks at all levels except depot.

Job training analysis matrix, listing the subsystems/equipments which comprise the system, the tasks to be performed, and the knowledge required to perform the tasks.

Training analysis summary, providing the learning objectives and the skills and knowledge required to perform the tasks.

J. The following data requirements may be placed on contract as needed by the SPO:

Data Requirement	DID No.	*Nev DID
Training and Training Equipment Plan	DI-H-7066	DI-ILSS-80076
Training Courses Proposal	DI-H-7067	
Task Skill Analysis Report	DI-H-7068	**DI-ILSS-8077
Training Courses/Curriculum Outline	DI-H-7069	
Instructor/Lesson Guides-Training Courses	DI-H-7070	
Student's Training Course Guide	DI-H-7071	
Audiovisual Aids, Master Reproducibles and Review Copies for Training Equipment and Training Courses	DI-H-7072	
Audiovisual Aids Index for Training Equipment and Training Courses	DI-H-7073	
Tests for Measurement of Student Achievement	DI-H-7074	
Student and Training Course Evaluation Forms	DI-H-7075	
Instructors Utilization Handbook for Simulation Equipment	DI-H-7076	
On-the-Job Training Handbook	DI-H-7077	
Technical Hands-on-Training System	DI-H-7078	

Data Requirement	DID No.	*New DID
Conference Agenda	DI-H-7088	
Conference Minutes	DI-A-7089	
Training Path System Documentation	DI-H-7090	DI-ILSS-80079
Personnel Performance Profiles	DI-H-7901	DI-ILSS-80078
Curriculum and Instructional Media Materials	DI-H-7092	
Factory Training Curriculum Materials	DI-H-7093	
LSA-075, LSAR Manpower, Personnel Integration (MANPRINT) Summary	DI-ILSS-80290	

* New DIDs approved December 10, 1985.
** Title is Manpower, Personnel and Training Analysis Report.

3.6 STANDARD CONTRACT DATA ITEMS

A. An applied LSA tailoring strategy, which identifies task outputs and projects task requirements for succeeding program phases, is shown in the ILS Plan. Normally, any interfaces between the LSA program and other system engineering analysis are also described in the plan. Thus, both engineering and ILS functional element requirements and analysis can be used for DID selection purposes. Technical data needed to support an ILS program are standardized and listed on the LSAR data records per the contractual agreements. As previously indicated, the initial step involves selection of the analysis tasks and the subsequent flow of data onto the LSAR record for purposes of recording, storing, and processing (see Figure 6). This collection of data or LSA documentation may equal that developed and documented in the system engineering/design process. Changes in program concepts, requirements, or schedules should be incorporated as they occur. Even though system engineering/design data are available at the contractor facility, the responsible program office should ensure the completion of Data Record A based on the tasks of MIL-STD-1388-1A and so specify this requirement in the solicitation.

B. The DIDs can be revieved to match the data element requirements; that is, the relationship between the LSAR records and associated DID can be examined in detail, down to the needed data elements. Table IV of MIL-STD-1388-2A provides a listing of the more common DIDs. As an example, Figure 7 makes a comparison between LSAR and two of these DIDs: DI-H-7057, Human Engineering Design Approach Document Maintainer, and DI-H-7068, Task and Skill Analysis Report. In addition, a determination as to whether LSAR reports can be used to satisfy a DID may be made by looking at MIL-STD-1388-2A, Figure 90, which shows the input data elements required for the reports (see Figure 8). This review process will provide the specific data elements and LSAR records. Based on this review, the DD Form 1949-1, LSAR Data Selection Sheet, can be compiled to make up the total LSAR data requirements. See Figure 9 for an example of the selection sheet.

C. To be useful in the training development effort, LSAR data must also be timely. It is important that the SPO establish schedule completion dates for the data products that utilize LSAR data. MIL-STD-

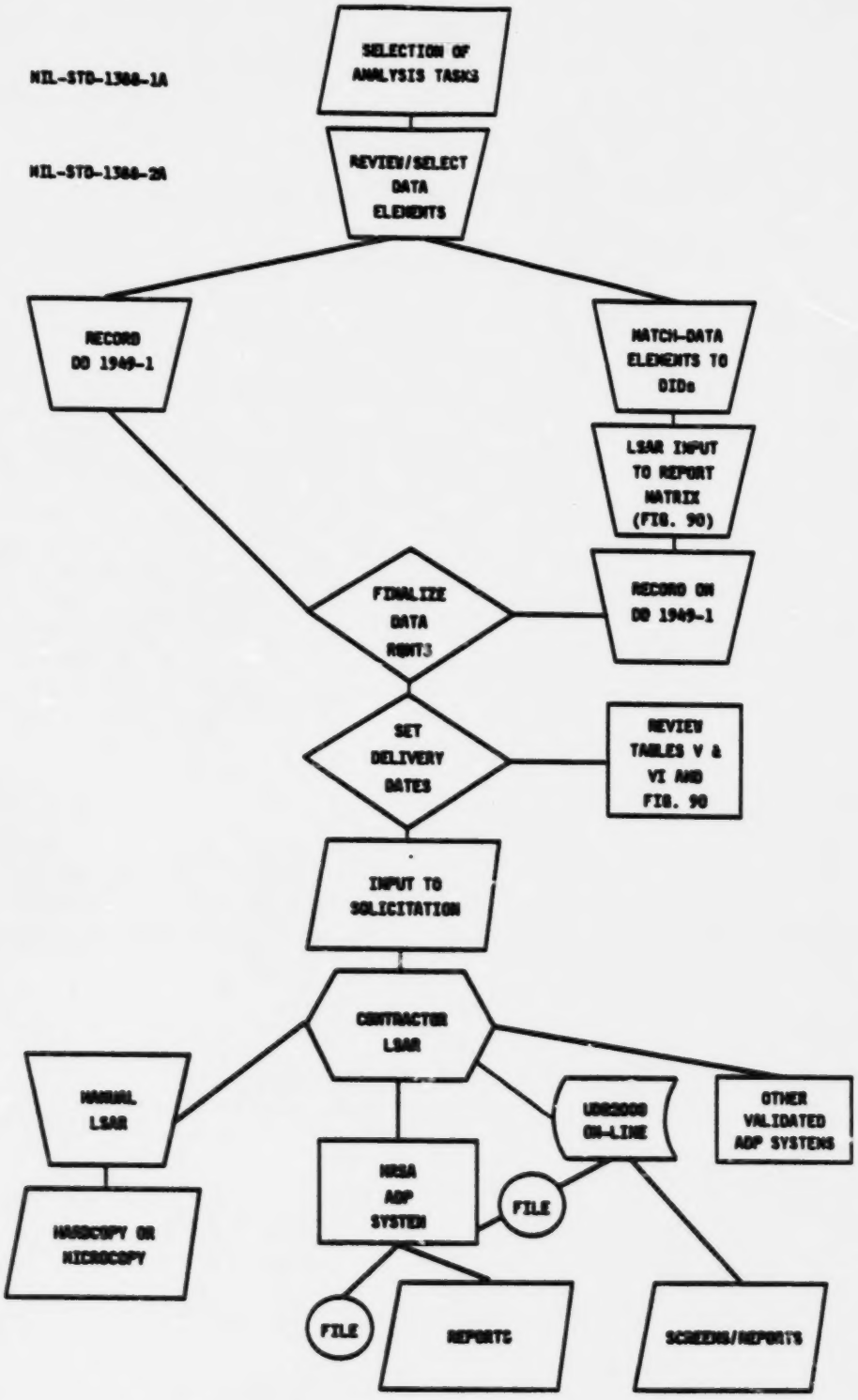

Figure 6. LSAR Tailoring

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DATA ITEM DESCRIPTION NUMBER AND TITLE	PURPOSE	LSAR APPLICATION	LSAR INTERFACE	
			MANUAL	AUTOMATED
MANPOWER AND PERSONNEL				
DI-H-7057, Human Engineering Design Approach Document Maintainer	This document provides a source of data to evaluate the extent to which equipment having an interface with maintainers meet human performance requirements and human engineering design criteria.	The LSAR, in conjunction with applicable sketches, drawings, or photographs, provides all the data required to satisfy the requirement of this DID.	Use the LSAR data record B for evaluation of individual human engineering considerations such as equipment accessibility, ease of maintenance, safety, test points, skills, training, use of interconnective devices, labeling, and fault location procedures. Use the LSAR data records B1, B2, D, D1, E, E1, F, and G to obtain additional information required by this DID related to task performance descriptions, identification of critical tasks, task failure, information, personnel, skills and training impacts, and special tool and support equipment.	Use the LSAR 050, 051 052, 053, 054, 055, 001 through 015 reports to obtain supportive information.
DI-H-7068, Task and Skill Analysis Report	To provide timely and accurate identification of technical tasks which will be performed by operator and maintenance personnel, job description, and manpower requirements necessary for the operation, maintenance, and repair of systems and equipment.	The LSAR provides all the data required to satisfy the requirements of this DID.	Obtain data required from the LSAR data records A, B, B1, B2, C, D, D1, E, E1, F, and G.	The LSAR 001, 002, 003, 004, 005, 006, 007, 008, 009, 011, 012, 013, 014, 015, 019, and 023 automated outputs all provide data applicable to the requirements of this DID.

Figure 7. Data Item Description (DID) Relationships to the LSAR

Source: MIL-STD-1388-2A, 20 July 1984 and Notice 1, 14 February 1986 (Table IV)

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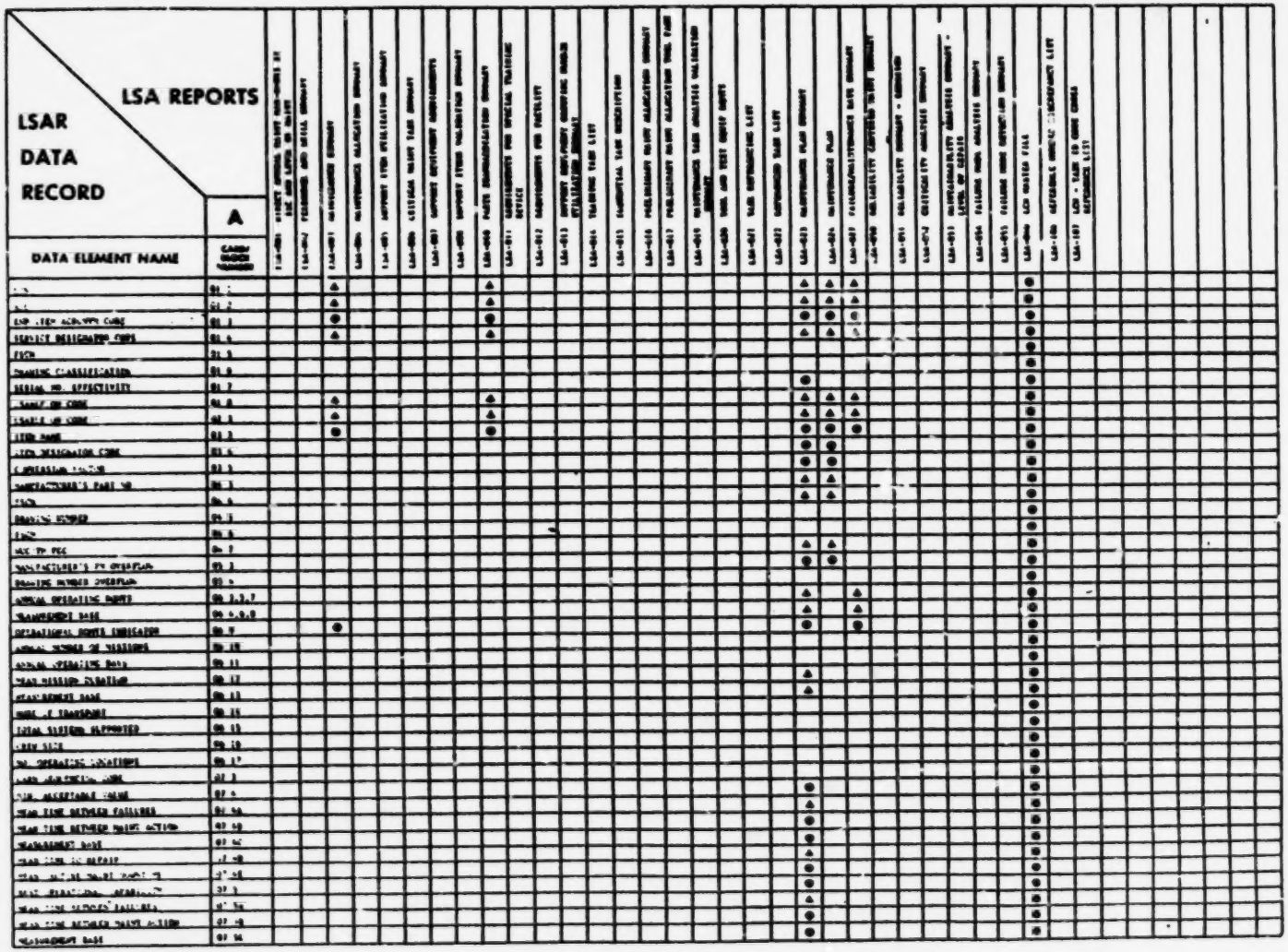

▲ Data elements required to produce a minimum useable report

● Additional data elements required to produce a complete report

Figure 8. LSAR Input to Report Matrix

Source: MIL-STD-1388-2A, 20 July 1984 and Notice 1, 14 February 1986 (Figure 90)

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PART I

LSAR DATA SELECTION SHEET

Form Approved
OMB No. 0704-0188
Exp Date: June 30, 1986

CARD/ BLOCK NUMBER	DED NO.	DATA ELEMENT NAME	REQUIRED
		LSAR DATA RECORD A	
01-1	197	LOGISTIC SUPPORT ANALYSIS CONTROL NUMBER *(Applies to complete A Record)* ▲	
01-2	023	ALTERNATE LSA CONTROL NUMBER CODE *(Applies to complete A Record as needed)* ▲	
01-3	108	END ITEM ACRONYM CODE	
01-4	414	SERVICE DESIGNATOR CODE	
01-5	139	FEDERAL SUPPLY CODE FOR MANUFACTURERS	
01-6	098	DRAWING CLASSIFICATION	
01-7	411	SERIAL NUMBER EFFECTIVITY	
01-8	536	USABLE ON CODE ▲	
	536	OPTION 1	
	536	OPTION 2	
	536	OPTION 3	
01-9	535	UPDATE CODE *(Applies to complete A Record)* ▲	
02-3	536	USABLE ON CODE ▲	
03-3	181	ITEM NAME	
03-4	178	ITEM DESIGNATOR CODE	
03-5	069	CONVERSION FACTOR	
04-3	213	MANUFACTURER'S PART NUMBER	
04-4	139	FEDERAL SUPPLY CODE FOR MANUFACTURERS	
04-5	099	DRAWING NUMBER	
04-6	139	FEDERAL SUPPLY CODE FOR MANUFACTURERS	
04-7	545	WORK UNIT CODE / TECHNICAL MANUAL FUNCTIONAL GROUP CODE	
05-3	214	MANUFACTURER'S PART NUMBER OVERFLOW	
05-4	100	DRAWING NUMBER OVERFLOW	
06-3,5,7	029	ANNUAL OPERATING REQUIREMENTS	
06-4,6,8	244	MEASUREMENT BASE	
06-9	285	OPERATIONAL REQUIREMENT INDICATOR	
06-10	027	ANNUAL NUMBER OF MISSIONS	
06-11	028	ANNUAL OPERATING DAYS	
06-12	234	MEAN MISSION DURATION	
06-13	244	MEASUREMENT BASE	
06-14	254	MODE OF TRANSPORT	
06-15	429	TOTAL SYSTEMS SUPPORTED	
06-16	073	CREW SIZE	
06-17	268	NUMBER OF OPERATING LOCATIONS	
07-3	051	CARD SEQUENCING CODE ▲	
07-4	248	MINIMUM ACCEPTABLE VALUE	
07-4A	235	MEAN TIME BETWEEN FAILURES	
07-4B	236	MEAN TIME BETWEEN MAINTENANCE ACTIONS	
07-4C	244	MEASUREMENT BASE	
07-4D	241	MEAN TIME TO REPAIR	
07-4E	219	MEAN ACTIVE MAINTENANCE DOWNTIME	
07-5	039	BEST OPERATIONAL CAPABILITY	
07-5A	235	MEAN TIME BETWEEN FAILURES	
07-5B	236	MEAN TIME BETWEEN MAINTENANCE ACTIONS	
07-5C	244	MEASUREMENT BASE	
07-5D	241	MEAN TIME TO REPAIR	
07-5E	219	MEAN ACTIVE MAINTENANCE DOWNTIME	
08-3	218	MAXIMUM TIME TO REPAIR	
08-4	312	PERCENTILE	
08-5	158	INHERENT AVAILABILITY	
08-6	003	ACHIEVED AVAILABILITY	
08-7	281	OPERATIONAL AVAILABILITY	
08-8	015	ADMINISTRATIVE AND LOGISTIC DELAY TIME	

▲ Required for automated processing

DD Form 1949-1, 84 JUL — *Previous editions are obsolete.* — Part I, Page 1

Figure 9. LSAR Data Selection Sheet

Source: MIL-STD-1388-2A, 20 July 1984 and Notice 1, 14 February 1986 (Figure 91)

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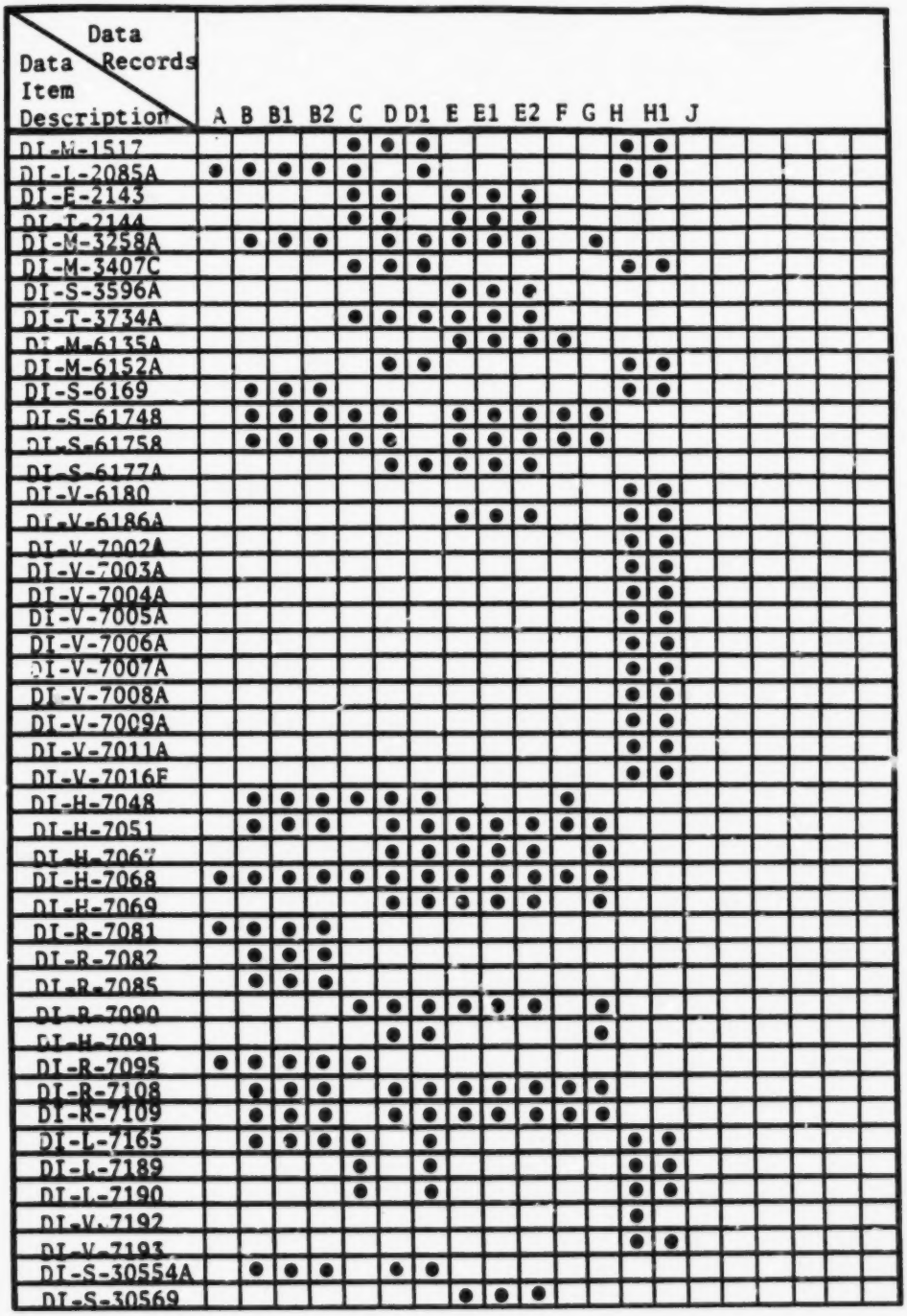
1388-2A recommends that the required delivery dates for DID deliverables be established along with the solicitation package. From this, then, the delivery dates for the LSAR data records can be determined. On several acquisition programs, the LSAR came too late. The B-1B and T-46 are two recent examples. In one case, the 3306 TES could not meet their ISD schedules because of having to wait on projected LSAR data because the contractor was using the engineering and related data sources. Deliverable LSAR data have in many cases been included as part of a single data package due upon completion of the effort. These are factors which contribute to LSAR data arriving late for the ISD process. Quoting in part from Appendix E, Figure 6, LSAR Tailoring MIL-STD-1388-2A, "scheduling completion of LSAR data must take into account interim product delivery dates, final product delivery dates, and schedule updates to final products. Each of these dates will impact the range of LSAR data required, the depth of data required (i.e., the hardware indenture levels and maintenance levels specified), and the number of updates to the LSAR data required. The LSAR completion schedule must then be coordinated with related program schedules (i.e., drawing release) to ensure availability of data for LSAR development." Tables V and VI of the standard provide a means to plan delivery dates or completion dates for each data record and for LSAR reports through careful selection of the DIDs delivery dates. Figure 10 shows DID to LSAR Record relationships; Figure 11 shows DID to LSAR Report relationships.

D. Finally, the deliverable LSAR data must be in a usable form. For the purposes of ISD, it must be in printed format or in a form which permits manipulation of the data. Ideally, an automated LSAR system, such as the UDB2000, provides the greatest ability to produce tailored products, respond quickly to on-line demand, and rapidly access reports/summaries. Again, reflecting on the B-1B program effort, LSAR data were delivered in disc format for use in ISD. However, the data records/reports could not be generated from the disc as a result of various equipment-related problems. Unfortunately delivery of the disc product represented a final, one-step, contractual package.

E. The UDB2000, using the Integrated Data Management System (IDMS) and the Integrated Data Dictionary (IDD), maintains the relationships among the data elements in the database and also provides a centralized dictionary in which to define and link together data elements, records, and files. The system has the database logically partitioned by end item, by contractor, and by agency. It affords the LSA analyst an on-line capability to access the status of the LSAR and to ensure that data relationships are properly established and maintained. Further, the system provides real-time calculation of numerous data elements. Elements are calculated at the time screens are displayed, ensuring that the calculations are based on the current values of the input variables. These real-time calculations provide for automatic entry of data that is dependent on other data in the system. As stated earlier, the data sheets and screens used in the UDB2000 system follow the main divisions of the data records of MIL-STD-1388-2A.



Data Item Description \ Data Records	A	B	B1	B2	C	D	D1	E	E1	E2	F	G	H	H1	J
DI-M-1517					●	●	●						●	●	
DI-L-2085A	●	●	●	●	●		●						●	●	
DI-E-2143					●	●		●	●	●					
DI-T-2144					●	●		●	●	●					
DI-M-3258A		●	●	●		●	●	●	●	●		●			
DI-M-3407C					●	●	●						●	●	
DI-S-3596A								●	●	●					
DI-T-3734A					●	●	●	●	●	●					
DI-M-6135A								●	●	●	●				
DI-M-6152A						●	●						●	●	
DI-S-6169		●	●	●									●	●	
DI-S-61748		●	●	●	●	●		●	●	●	●	●			
DI-S-61758		●	●	●	●	●		●	●	●	●	●			
DI-S-6177A						●	●	●	●	●					
DI-V-6180													●	●	
DI-V-6186A								●	●	●			●	●	
DI-V-7002A													●	●	
DI-V-7003A													●	●	
DI-V-7004A													●	●	
DI-V-7005A													●	●	
DI-V-7006A													●	●	
DI-V-7007A													●	●	
DI-V-7008A													●	●	
DI-V-7009A													●	●	
DI-V-7011A													●	●	
DI-V-7016F													●	●	
DI-H-7048		●	●	●	●	●	●				●				
DI-H-7051		●	●	●		●	●	●	●	●	●	●			
DI-H-7067						●	●	●	●	●		●			
DI-H-7068	●	●	●	●	●	●	●	●	●	●	●	●			
DI-H-7069						●	●	●	●	●		●			
DI-R-7081	●	●	●	●											
DI-R-7082		●	●	●											
DI-R-7085		●	●	●											
DI-R-7090					●	●	●	●	●	●		●			
DI-H-7091						●	●					●			
DI-R-7095	●	●	●	●	●										
DI-R-7108		●	●	●		●	●	●	●	●	●	●			
DI-R-7109		●	●	●		●	●	●	●	●	●	●			
DI-L-7165		●	●	●	●		●						●	●	
DI-L-7189					●		●						●	●	
DI-L-7190					●		●						●	●	
DI-V-7192													●		
DI-V-7193													●	●	
DI-S-30554A		●	●	●		●	●								
DI-S-30569								●	●	●					

Figure 10. DID to LSAR Record Relationships

Source: MIL-STD-1388-2A, 20 July 1984 and Notice 1, 14 February 1986

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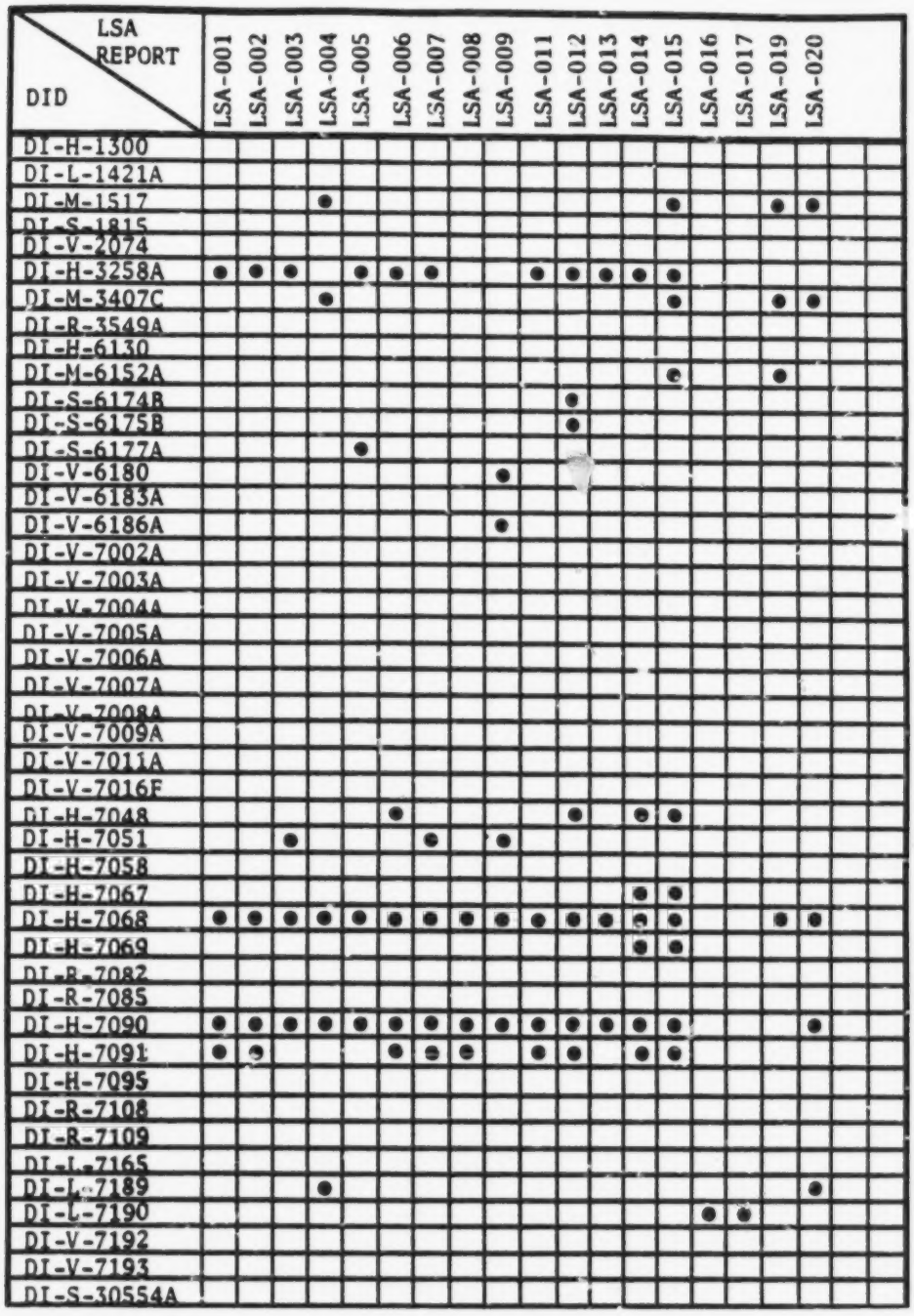

DID \ LSA REPORT	LSA-001	LSA-002	LSA-003	LSA-004	LSA-005	LSA-006	LSA-007	LSA-008	LSA-009	LSA-011	LSA-012	LSA-013	LSA-014	LSA-015	LSA-016	LSA-017	LSA-019	LSA-020		
DI-H-1300																				
DI-L-1421A																				
DI-M-1517				●										●			●	●		
DI-S-1815																				
DI-V-2074																				
DI-H-3258A	●	●	●		●	●	●			●	●	●	●	●						
DI-M-3407C				●										●			●	●		
DI-R-3549A																				
DI-H-6130																				
DI-M-6152A														●			●			
DI-S-6174B											●									
DI-S-6175B											●									
DI-S-6177A					●															
DI-V-6180									●											
DI-V-6183A																				
DI-V-6186A									●											
DI-V-7002A																				
DI-V-7003A																				
DI-V-7004A																				
DI-V-7005A																				
DI-V-7006A																				
DI-V-7007A																				
DI-V-7008A																				
DI-V-7009A																				
DI-V-7011A																				
DI-V-7016F																				
DI-H-7048						●					●		●	●						
DI-H-7051			●				●		●											
DI-H-7058																				
DI-H-7067													●	●						
DI-H-7068	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●		
DI-H-7069													●	●						
DI-R-7082																				
DI-R-7085																				
DI-H-7090	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●		
DI-H-7091	●	●				●	●	●		●	●		●	●						
DI-H-7095																				
DI-R-7108																				
DI-R-7109																				
DI-L-7165																				
DI-L-7189				●														●		
DI-L-7190															●	●				
DI-V-7192																				
DI-V-7193																				
DI-S-30554A																				

Figure 11. DID to LSAR Report Relationships

Source: MIL-STD-1388-2A, 20 July 1984 and Notice 1, 14 February 1986

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3.7 USEFULNESS OF LSAR FOR TRAINING DEVELOPMENT

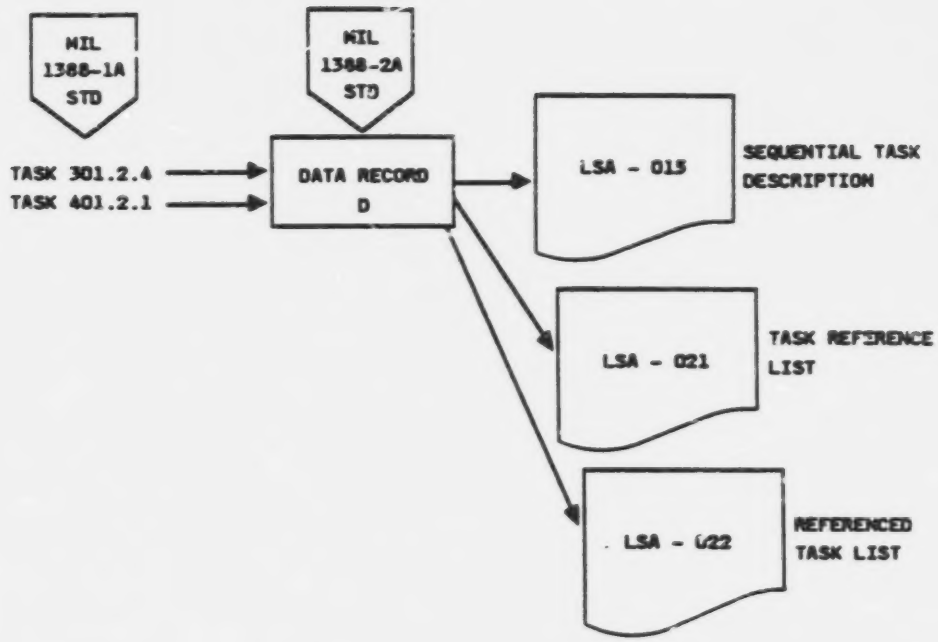
A. The data recorded through the LSAR process become the basis for translating data into usable training courses and devices. At present, ISD or a form of ISD is used to transform LSAR task data into a job task listing relating tasks, skills, and knowledge levels for training purposes. ISD processes are used by both the Air Force and contractors.

B. An ISD approach used by the McDonnell Aircraft Company to develop a three-volume F-15E Task and Skills Analysis Report illustrates a tailored procedure for the application of LSAR to training development. These volumes consisted of:

> Volume I: Task Inventory. This volume specified the tasks, skills, and knowledges required for satisfactory job performance. These, in turn, form the basic criteria used in determining training media, course sequencing, and objective formatting. The tasks, skills, and knowledges are developed by subject-matter experts, complemented by their instructional designs, based on engineering and vendor technical data, LSA data, and prior experience on similar weapon systems.
>
> Volume II: Skills and Knowledge. This volume listed the skills and knowledge required to accomplish each task identified in Volume I. Also shown is the required training, such as entry-level behavior, study lessons, and hands-on-training. The development process provides a chronological listing of tasks, supporting skills and knowledge, task source, support material, and training required by duty area.
>
> Volume III: Training Analysis Summary. This volume listed suggested lesson topics, individually, in the form of a final or "Terminal" objective supported by the "Enabling" objectives and the associated skills and knowledge requirements. The lesson is carried to a sub-level sufficient to satisfy job performance requirements.

C. The MIL-STD-1388-2A data records are designed to provide a logical approach to documenting maintenance task analysis and identifying the associated skills needed to perform the tasks. Data Record D, Operation and Maintenance Analysis (Figure 12) provides a means to record tasks in a sequential manner to the desired maintenance levels identified by the requiring authority. Block 5, Sequential Task Description, serves to document narratively in a step-by-step manner, all subtasks and task elements needed to perform the task under contractor engineering and design analysis. The tasks should be documented in sufficient detail, and so sequenced, to avoid any technically incorrect or missing procedures. The military standard clearly states the degree of documentation required on Data Record D.

D. Data Record D1, Personnel and Support Requirements (Figure 13), is a further refinement of needs in the analysis process. This record identifies personnel, training, support equipment and supply support



Provides: Specific Skill Specialty Requirements - Each Step of Analysis

Initiated: Started During D&V Phase; Applied During Full Scale Development (FSD)

Data Source: LSA Subtasks 301.2.4 and 401.2.1

Output:
- LSA - 015 Sequential Task Description
- LSA - 021 Task Referenced List
- LSA - 022 Referenced Task List

Purpose: Prepare Draft Maintenance Publications, Review and Control Reference Task List

Figure 12. Data Record D Operation and Maintenance Task Analysis

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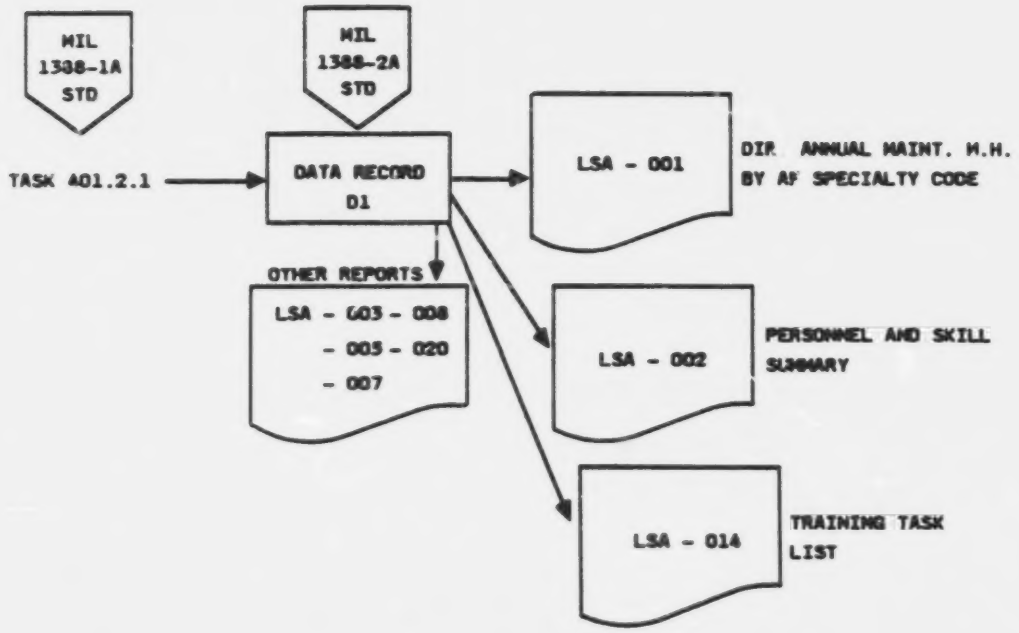

Provides:	Training, Personnel, Support Equipment, and Supply Support to Accomplish Each Task Shown on the D Record
Initiated:	When LSA Task 401 is Initiated
Data Source:	LSA Subtask 401.2.1
Output:	LSA - 001 Direct Annual Maintenance Man-Hours by Skill Specialty Code LSA - 002 Personnel and Skill Summary LSA - 014 Training Task List
Purpose:	Establish Basis for Training Recommendations

*Other LSAR Reports Available

Figure 13. Data Record D1 Personnel and Support Equipment

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requirements for the tasks listed on the D Record and the C Record (Figure 14). It is important to note that the LSAR process, through the system engineering and design, provides the information needed to determine training requirements. It is incumbent upon the program offices to state their LSAR requirements in contractual agreements. This is necessary whether training is to be developed in-house or by contract. The D1 Record data elements include Skill-Level Code, Skill Specialty (or Air Force specialty), Skill Specialty Evaluation Code, and number of personnel needed per specialty.

E. Data Record E, Support Equipment or Training Material Description and Justification (Figure 15), lists information related to peculiar support and test equipment, test sets, and training material requirements of the system. Tasks described on C and D Data Records which show use of support or test equipment or require training equipment should be shown on separate E Data Records. Data Record E provides a more detailed description and justification which can be used to document support equipment for contracting purposes. The record is normally prepared during FSD.

F. The LSAR also includes the Data Record G, Skill Evaluation and Justification (Figure 16), which describes and justifies new or modified personnel skills required to support the weapon system and associated equipment. This is a continuation of the Data Record D1 analysis which listed the new or modified skill requirements. The G Record is designed to provide information such as:

Duty position requiring new or revised skill

Air Force Specialty from which personnel can be obtained

Test score

Rank/date/civilian grade

Skill specialty code assigned new duty position

Task codes (described on Data Records C and D)

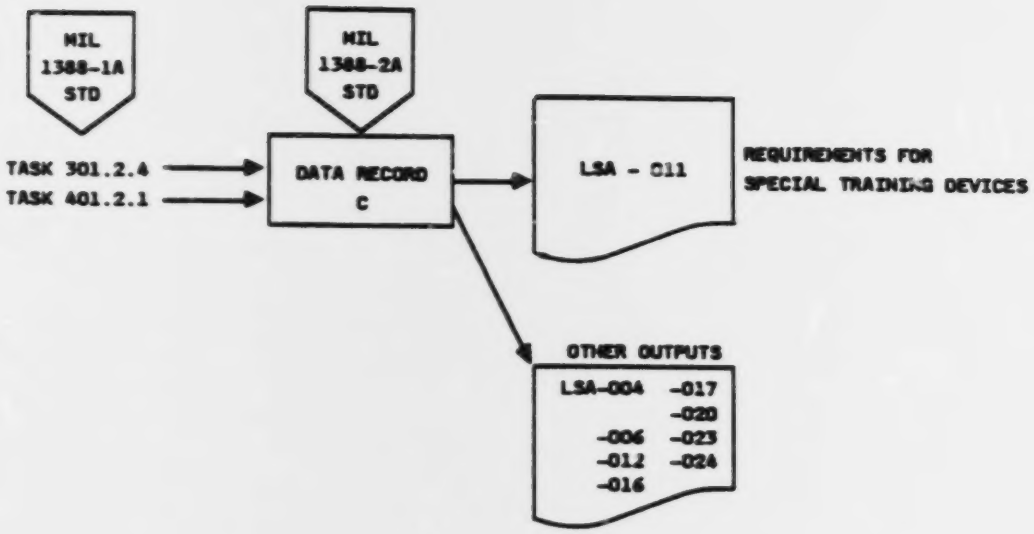
Physical and mental requirements

Educational qualifications: academic subjects, specialized subjects, specialized degrees and licenses, etc.

Additional training requirements

Justification

G. DD Form 1949-1, previously discussed, correlates directly with the data records. Properly used, this form is a working document which will ensure the training elements are developed by the performing authority.



Provides: Requirements for Training Equipment

Initiated: During the Demonstration and Validation (D&V) Phase

Data Source: LSA Subtasks 301.2.4 and 401.2.1

Output: *LSA-011 Requirements for Special Training Devices

Purpose: Identify New or Modified Support Requirements

*Other LSAR Reports Available

Figure 14. Data Record C Operation and Maintenance Task Summary

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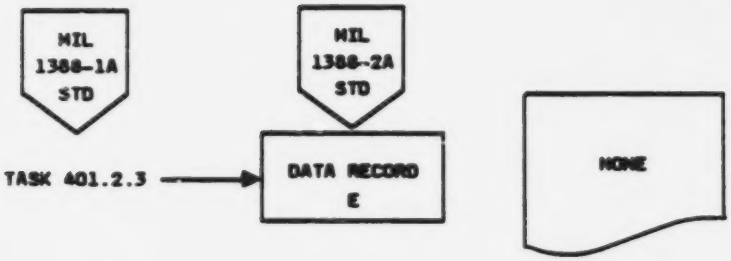

Provides:	Information on Peculiar Support/Test Equipment and Training Material Requirements of the System
Initiated:	During FSD Phase
Data Source:	LSA Subtask 401.2.3 with Inputs from 303.2.6, 303.2.8, and Training Specialists
Output:	None. *E Record is Manually Prepared; Included in LSAR Package
Purpose:	Supplements Reports Generated By C and D1 Data

*This Record is Automated in the UDB2000

Figure 15. Data Record E Support Equipment or Training Material Description and Justification

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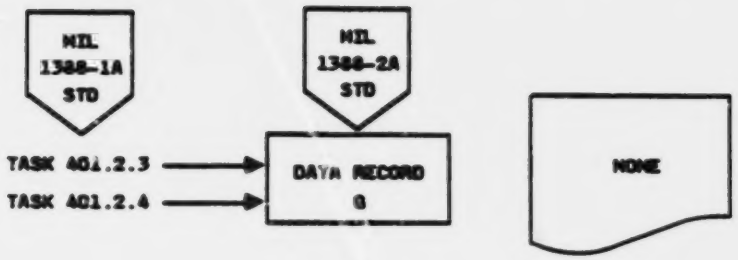

Provides: Description and Justification for New or Modified Skills

Initiated: During FSD Phase

Data Source: LSA Subtasks 401.2.3 and 401.2.4

Output: None. *G Record is Manually Prepared; Included in LSAR Package

Purpose: Basis for Recommending a Task for Training

*This Record is Automated in the UDB2000

Figure 16. Data Record G Skill Evaluation and Justification

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H. The proper selection of LSAR data elements will enhance the training development effort. The SPO, through the Training Planning Team, must take advantage of the procedures prescribed within MIL-STD-1388-1A and -1388-2A. Although procedures and functional duties vary among the many separate Program Offices, the LSAR person should be included in all planning efforts involving training development. The flow of LSAR documentation into training development is shown in Figure 17.

I. During this review, it was noted that LSA analysis did not always coincide with training development requirements but rather, followed a separate path coinciding with hardware development and other Program Office requirements. In addition, the determination for performing LSA and LSAR analysis was tied to the maturity of the weapon system (e.g., the never development effort of C-17 versus the more established programs, such as F-16 and F-15). Another consideration for the older programs was the cost/benefits. To request a complete system LSA late in the life cycle of the weapon system would not be cost effective; however, an application of LSA on modifications and engineering change proposals could be most beneficial.

J. Each Program Office is responsible for setting LSA requirements. However, each office has its own finely drawn doctrine, unique capabilities within assigned personnel, and particular operating-technical requirements, all of which can influence training development. It is important that training be afforded the same consideration as the other functional areas (engineering, logistics, financial control, test, and evaluation) and that a full-time specialist be located in the SPO. At present, this is not always the case.

3.8 AUTOMATING THE PROCESS

A. Our findings noted that decisions on training and training devices are not based on models but upon rational and considered judgments by the individuals who are best suited to make such assessments. However, such assessments require a structured process or procedure leading to the final objectives of determining training requirements -- all within Air Force concepts and Government standards, to include applicable data item descriptions. The process must be complete and done in a manner that is linear and interrelated. When Air Force concepts and a form of ISD procedures were applied in the B-1B effort by a contractor, a systematic and structured analysis approach resulted. The goal was to have SMSs in one working session, break down each task to identify:

All steps and activities needed to perform the task;

all skills and knowledge for performance of each step/activity;

hands-on training required for each skill/knowledge;

all other types of tasks not requiring hardware;

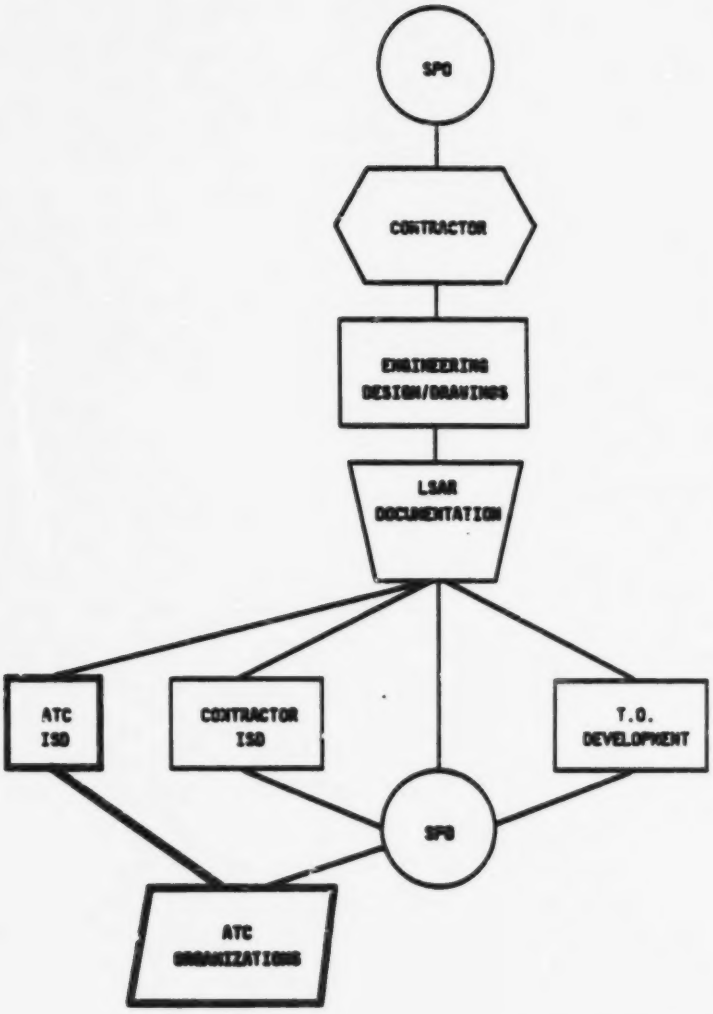

Figure 17. LSAR for Training Development in Acquisition

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all training device requirements; and

all training media.

B. At this same time, it was necessary to have computer application available to control and manage the analysis effort. The automated process that was used served to track and format data at the time task analysis was conducted. This process saved time, permitted immediate use of the data for analysis and, under a company program, formatted the data for hands-on training and training device requirements.

C. Application of such a procedure, either by in-house Air Force personnel or by contractor firms, could greatly enhance the development of training requirements in a considerably shorter time period. Using an automated system with a database management program, training requirements can be listed, commonality analyses between tasks can be identified, selected data can be formatted and printed, and training concepts can be developed to meet future acquisition program needs. ISD personnel and program office training personnel could well assess their expectations for training courses and training devices, since the systematic and structured analysis by SME/SMS using contractor engineering and LSAR data would provide a realistic data base and identify the necessary training descriptions.

3.9 ADAPTABILITY OF UDB2000 FOR TRAINING DEVELOPMENT

In their evaluation of the UDB2000 software, the 3306 TES focused on the content of MIL-STD-1388-2A and the UDB2000 data screens. The 3306 TES found that the UDB data screens provide "quick and easy" access to all information necessary for the ISD process. They believe that with nominal training, ISD analysts could perform training development with considerable savings in time, manpower, and money for the data collection process. Of course, LSAR data would still have to be made available in sufficient quantity to realize the advantages of the UDB2000.

3.10 NEW DATA ELEMENTS/ITEMS

A. The 3306 TES identified 53 LSAR data elements useful for ISD purposes. Included are those data elements used for indexing purposes, such as the Alternate LSA Control Number, cardblock of A01-2, shown on LSA reports 015 and 060 (see Table 1). These data elements can be collected by reviewing 12 LSARs, six LSAR reports, or 28 UDB2000 data screens.

B. One new data element recommended specifically for training development was a narrative entry to describe Student Target Population for a weapon system under development or major modification. As a minimum, the new data element should include the Skill Specialty Code (i.e. AFSC), Skill-Level Code (3, 5, 7, or 9), prerequisite education and training, previous weapon system experience, and security clearance requirements.

Table 1.
Training-Related Data Elements
for ISD

	Data Element	Related DED	Card-Block	LSA Report
1.	Additional Skill Requirement: Skill Requiring a New or Revised Skill Code	010	G04-5	075
2.	Additional Skills and Special Training Requirements	011	E16-5	070
3.	Additional Training Requirements	013	G07-5	075
4.	Alternate LSA Control Number	023	A01-2	015 060
5.	Articles Requiring Support	031.1	E09-4	070
6.	Description and Function	086.1	E19-5	070
7.	Duty Position Requiring a New or Revised Skill	101	G02-4	075
8.	Educational Qualifications	103	G06-5	075
9.	End Item Acronym Code	106	A01-3	060 061
10.	Failure/Damage Effects	120	B14-6	060
11.	Failure Detection Method	121	B15-6	060
12.	Failure Mode and Cause/Damage Mode	126	B13-6	060
13.	Failure Mode Indicator	128	B11 thru B18-3	060
14.	Functional Analysis	145.1	E17-5	070
15.	Hazardous Maintenance Procedures Code	155	C06-10	060
16.	Item Function	179	B08-4	060
17.	Item Name	181	A03-3 D07-8 E11-3 H01-9	060 015 070 061
18.	Justification	183	E20-5 G08-5	--- ---

Table 1 (Continued)
Training-Related Data Elements
for ISD

Data Element	Related DED	Card-Block	LSA Report
19. LSA Control Number	197	A01-1	014 015 060 061 075
20. Maintenance Concept	204	B10-4	060
21. Manufacturer's Part Number	213	A04-3	060
22. Manufacturer's Part Number Overflow	214	A05-3	060
23. Mean Elapsed Time	220	D06-5	015
24. Mean Time Between Failures	235	B07-4	060
25. Mean Time Between Maintenance Actions	236	B07-5	060
26. Mean Time to Repair	241	B07-13	060
27. National Stock Number and Related Data	259	E05-3 H02-5	070 061
28. Performance Standards	313	D06-7H	014
29. Person Identifier	316	D02-7	015
30. Physical and Mental Requirements	319	G05-5	075
31. Qualitative and Quantitative Maintainability Requirements	348	B09-4	060
32. Quantity Per Task	354	D07-9	060
33. Reference Number	372	H01-1	061
34. Referenced Task	376	D03-7	015
35. Security Clearance	399	G02-7	---
36. Sequence Insertion Line Number	403	D02-3	015
37. Sequence Line Number	406	D02-2	015
38. Sequential Task Description	410	D02-5	015
39. Skill Level Code	422	A11-7	060

Table 1 (Concluded)
Training-Related Data Elements
for ISD

Data Element	Related DED	Card-Block	LSA Report
40. Skill Specialty Code (SSC)	423	A11-6 D04-4	060 015
41. SSC Assigned New Duty Position	424	G01-3	075
42. Skill Specialty From Which Personnel Can Be Obtained	434	G02-5	---
43. Source, Maintenance and Recoverability	436	H11-7	061
44. Support Equipment Full Item Name	455.1	E13-3	070
45. Support Equipment Recommendation Data (SERD) Number	458	E02-3	070
46. Support Item Sequence Code	460	D07-4	060
47. Task Code	467	C06-3	015 060
48. Task Condition	468	D06-7G	014
49. Task Frequency	470	C06-4	015 060
50. Task Identification	472	C06-6	015 060
51. Task Identification Code	473	C06-7	015 060
52. Unit of Measure	524	D07-10	060
53. Work Unit Code/Technical Manual Functional Group Code	545	A04-7	015 060

Source: 3306 TES Letter, Subject: UDB2000 Study, 30 October 1986, Attachment 1

C. The data element Training Rationale, covered by DED 503, was cited as having eight codes to justify training requirements recommendations. The 3306 TES recommended a change to a narrative entry or adopting the use of data element, Justification, covered by DED 183. It was further recommended that the data element Justification be added to LSAR reports 070 and 075 to support training recommendations.

3.11 NEW UDB DATA SCREENS/OUTPUT REPORTS

The 3306 TES also identified the need for new screens, designed especially for training-related data. Presently, the UDB2000 has 28 data screens that contain information/data elements needed for the ISD process. Although access to these screens was found to be easily accomplished by the training analysts, additional research time is needed by the 3306 TES to fully define and construct additional screens that could enhance training development. Further, the squadron believes that the UDB screens developed to date could be an asset to other LSA users and acquisition-related organizations.

3.12 REVISION TO MIL-STD-1388-2A

A. To better define the student target population, a data element descriptor (DED) should be established to do so. As noted, the new data element should include the skill specialty code (AFSC), skill-level code, prerequisite education/training, previous weapon system experience, and security clearance. The DED should be structured to capture a narrative summary of this type of information. At present, DED 434, Skill Specialty From Which Personnel Can Be Obtained, provides a specialty code; however, it does not define previous weapon system experience, education and training, or prerequisite skills and knowledge information.

B. Training Rationale, DED 503, should be examined for change to a narrative entry or be replaced by Justification, DED 183. Although DEC 503 has eight codes to justify training requirements, a narrative-type entry would allow training analysts the latitude to descibe their decision logic. The 3306 TES also recommended that the justification information be added to LSAR 070 and 075 reports to support training recommendations.

IV. CONCLUSIONS

4.1 AUTOMATING TRAINING REQUIREMENTS PROCESSES

A. The weapon system acquisition process must be analyzed in terms of both systems design and training system design. The training system design process can begin earlier through the use of mission area analysis and comparability analysis, which include all the pertinent documents leading up to the development phase. Training systems, in turn, can be further examined as to the subsystem functional requirements and the task data necessary for operational and maintenance purposes. Data to support this analysis come primarily from the

contractors involved and the SPO, their design engineers and logistics specialists. Although the process currently is conducted by in-house Air Force technicians and a number of contractor agencies, it is limited in scope and depth by the degree of automation, the availability of data, and the qualifications/training of subject-matter specialists/experts.

B. Task analysis and associated task information gathering is a major effort of the overall training systems development program performed by the SPO and ATC. Engineering and design data must be made available through contractor deliverables according to MIL-STD-1388-2A, usually in the form of LSAR and DID deliverables. The deliverables should also be timely and incremented for analysis beginning early in the acquisition process. For those systems where design is not final or complete, consideration should be given to generic task analysis using comparability data from a predecessor system as input.

C. Automation of LSAR data, with on-line capability for use by the SPO and ISD analysts would produce a more direct and timely information link, and also afford training and/or MPT analysts an earlier start in task list development as the new system equipment lists surface. From the task lists begins the identification of subtasks or substeps required to perform the task. This lower-level description will define the actions related to each specific task and the systems/equipments on which the action is to be performed. SMSs can list all conditions relevant to the steps and substeps of the tasks, (e.g., special tools, equipment conditions, and safety measures). LSARs should be reviewed in sufficient detail to capture all such information and data elements.

D. Following the listing and description of all steps and substeps, the necessary skills/knowledge must be determined by the subject-matter experts. This may be accomplished using a format (forms) or prompt procedure to ensure all knowledge and skill requirements are made known. The application of a data base system method similar to that used for the B-1B can format the data for needed outputs. A commonality analysis would provide information on like data as to tasks, steps, substeps, skills, knowledge, training requirements, and training systems, as well as the recall or manipulation of other selected data.

E. Automation of training requirements data would permit earlier processing of information to identify needed training courses, media, hardware, and training locations by the SPO and ATC (see Figure 18).

4.2 AVAILABILITY OF INFORMATION

A. Information, or lack of information, influences training and training equipment development, in that there continues to be a difference in time-phasing of events between training systems development and weapon system acquisition. Some of this difference can be attributed to the many coordinating and involved offices, and in part to a late finalization in design and/or operational and maintenance concepts. Regardless of the underlying causes, the SPO must lead the management

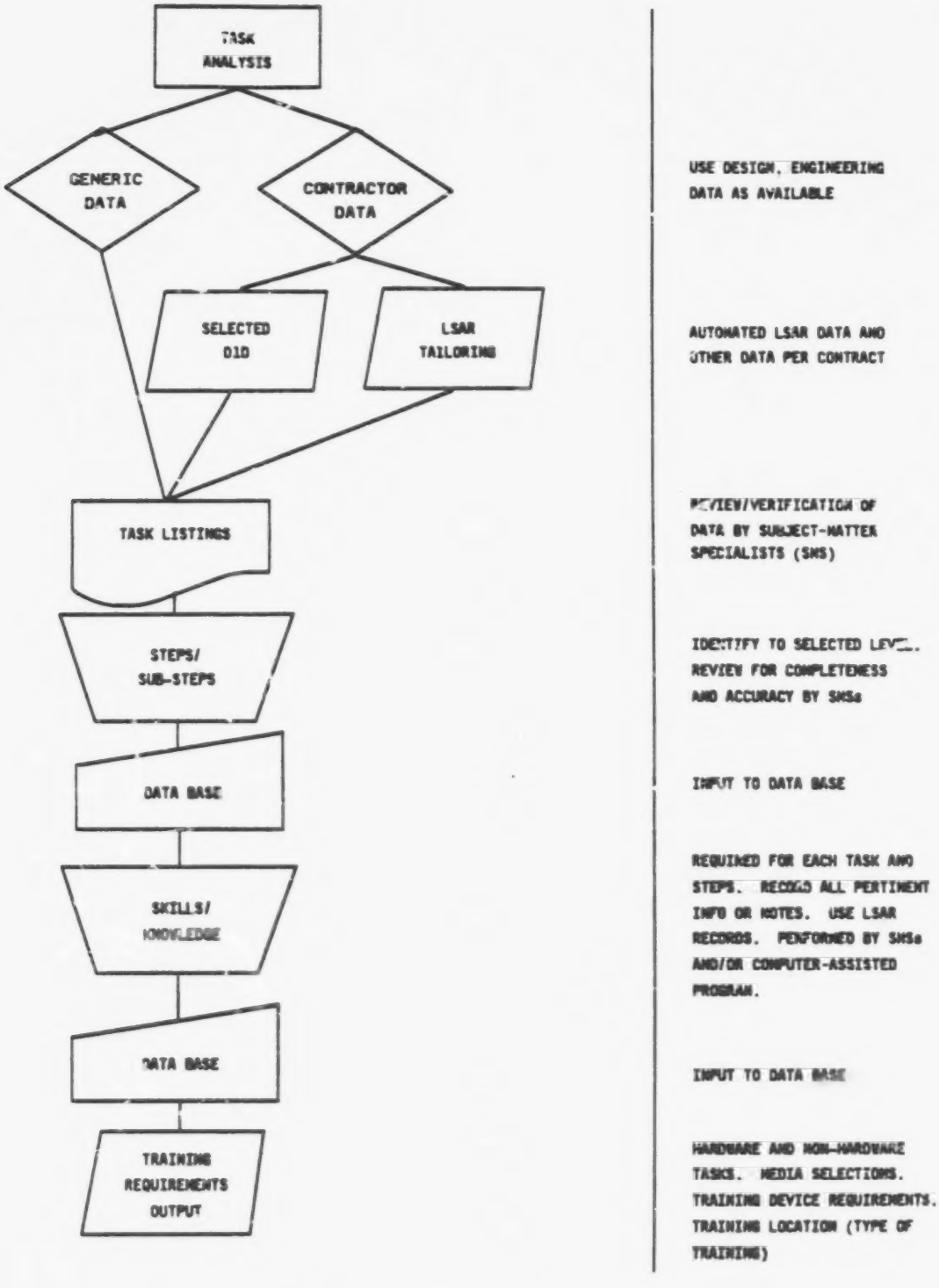
TASK ANALYSIS
GENERIC DATA
CONTRACTOR DATA
SELECTED DID
LSAR TAILORING
TASK LISTINGS
STEPS/ SUB-STEPS
DATA BASE
SKILLS/ KNOWLEDGE
DATA BASE
TRAINING REQUIREMENTS OUTPUT
USE DESIGN, ENGINEERING DATA AS AVAILABLE
AUTOMATED LSAR DATA AND OTHER DATA PER CONTRACT
REVIEW/VERIFICATION OF DATA BY SUBJECT-MATTER SPECIALISTS (SMS)
IDENTIFY TO SELECTED LEVEL. REVIEW FOR COMPLETENESS AND ACCURACY BY SMSs
INPUT TO DATA BASE
REQUIRED FOR EACH TASK AND STEPS. RECORD ALL PERTINENT INFO OR NOTES. USE LSAR RECORDS. PERFORMED BY SMSs AND/OR COMPUTER-ASSISTED PROGRAM.
INPUT TO DATA BASE
HARDWARE AND NON-HARDWARE TASKS. MEDIA SELECTIONS. TRAINING DEVICE REQUIREMENTS. TRAINING LOCATION (TYPE OF TRAINING)

Figure 18. Automated Training Requirements Process

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effort in the actual acquiring of the training and maintenance training devices.

B. If information is not available, SMSs will make necessary assumptions in order to complete the ISD and the documentation for starting the training equipment acquisition. This is often an initial or "get-started" effort, with the goal of meeting schedules and having needed training programs on board before or by IOC. It is reasonable to believe that any new program not fully committed to a method of operation, maintenance concept, or design agreement would continue to distract the training development process.

C. Another area that impacts training development is the defining of the trainee population. The user MAJCOM, in addition to stating the maintenance concept, should also define the trainee population in terms of education and training qualifications and the AFSCs and skill levels needed. This often turns out to be a minimum-effort result,or a difficult task, in the sense that MAJCOMs do not always have the personnel or experience to adequately define trainee population. This, in turn, impacts the ISD process in that training is built around the anticipated need for new skills and knowledge requirements. Therefore, a need for careful judgement by SMSs is required today as in the past.

D. Another factor of concern is deliverable task data for the task and skill analysis effort which is basic to completing an ISD. The present investigation showed that the data come late, usually after Milestone II or the DEM/VAL phase, and in some cases are not furnished through MIL-STD-1388-2A LSAR. In essence, a weapon system in a prototype phase will lack the maturity to produce completely usable or valid data.

E. Until FEA can be developed in a manner to satisfy training-related information needs, ISD teams, whether Air Force or contractor, must continue to work with the SPO, program contractors, MAJCOM, etc. to develop training and training equipment requirements.

4.3 ORGANIZATIONAL/FRONT-END ANALYSIS INFLUENCE

A. Training must be given adequate, early consideration as part of the front-end analysis. As tools to aid FEA (such as the MPT Systems Model) are further refined and accepted into the acquisition community, the system managers must provide increased authority to the Training and LSA project officers. Historically, training has been viewed as only one of many ILS elements, often without the benefit of an experienced person assigned to manage the training program. This tends to downplay the importance of training system development as part of the weapon system design effort.

B. It should be noted that front-end analysis begins at the system level in the Concept Exploration phase (CE) and proceeds toward a more detailed level in DEM/VAL phase. Thus, with earlier MPT influences, the specifications for maintenance and aircrew training devices could be developed in the DEM/VAL phase versus the present method of

delaying ISD until full-scale development. Further, it must be remembered that conceptual data formed during FEA are continually refined, influencing instructional design and finally, training methods and media development. If properly directed, FEA data will provide input into LSA/LSAR, and subsequently provide data for the ISD documentation.

C. Influencing the design process under a strongly supported FEA necessitates the timely flow of tailored data from the prime contractor to the SPO. Thus, the training and LSA managers must have properly specified their needs in the CDRLs for the CE and DEM/VAL phases and have had sufficient authority to interface with the contractor engineers, LSAR personnel, and SPO users of the data.

4.4 MILITARY STANDARD GUIDANCE

MIL-STD-1388-1A guidance was found to be adequate. The Military Standard provides an LSA tailoring strategy for identifying necessary tasks to meet system program objectives. The guidance is stated at a level of detail and with time-phasing that should permit proper planning of logistics elements to include training programs and requirements. The standard is applicable to both contractor and Government activities. The Military Standard "Foreword" states, in part, "Increasing awareness that supportability factors, such as manpower and personnel skills, are a critical element in system effectiveness has necessitated early support analyses, the establishment of system constraints, design goals, thresholds and criteria in these areas, and the pursuit of design, operational and support approaches which optimize life cycle costs and the resources required to operate and maintain systems. This standard was prepared to identify these early analysis requirements and foster their cost effective application during system acquisitions." As such, LSA guidance is designed to assist Program Offices but allows for flexibility and adaptation to specific programs.

4.5 DATA ELEMENTS/ITEMS

A. The LSAR system, MIL-STD-1388-2A, contains the data elements and data items useful in training development. Table 2 lists those data elements considered to be useful within acquisition for training development purposes in general. The table lists the LSAR data record, card number and block, and the applicable LSA report numbers. Lower-level data items are included where applicable. The corresponding UDB screens/sheets are shown for reference under the UDB2000 system. In addition, the 3306 TES identified 53 LSAR data elements needed for ISD purposes during their review. These 53 data elements are listed in Table 1.

B. Also, during development of the UDB, additional data elements useful for Air Force purposes were identified within logistics; some may have future application for training purposes. Table 3 lists these data elements by noun, purpose, and the UDB screen/sheet location.

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Table 2
Training-Related Data Information
(MIL-STD 1388-2A and UDB2000)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Card No	Block	LSA Reports	UDB LSAR Data Sheets/ Screen
1. Item Name	181	Federal Item Directory for Supply Name		A	A03	3	015, 060, 061, 070	A1-H., A[illegible]-B., B1-H., D[illegible]-J., E, F1-F., H1-L., J1-B.
2. Work Unit Code/ Technical Manual Functional Group Code	545	WUC and Federal Group Code		A	A04	7	015, 060	A1-D., B1-O., H36-K., LCN-F.
3. Skill Specialty Code	423	Air Force/Federal Service Pubs		A	A11	6	001, 002, 007, 011, 012, 014, 015, 019, 023, 060	A5-D, D3-C.3, D5-C, E
4. Skill-Level Code	422	Basic Intermediate Advanced	B I A	A	A-11	7	023, 060	A5-E, D3-C.2
5. Logistics Considerations	195	Yes No N/A	Y N Z	B	B06	3	051, 060	B13-B
a. Standardization	448							
b. Accessibility	002							
c. Maintenance Ease	205							
d. Safety	395							
e. Test Points	485							
f. Skills	435							
g. Training	500							

Table 2 (Continued)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Data Record Card No	Data Record Block	LSA Reports	UDB LSAR Data Sheets/ Screen
h. Connectors for Ease of Removal	061							
i. Packaging and Transportation	302							
j. Fault Location	137							
k. Labeling	184							
l. Design for Self-Protection Against Damage after Failure	089							
m. Corrosion/Rust Control	071							
6. Mean Time Between Failures	235	Shown to the nearest tenth		B	B07	4	060	A3-D.1, A3-D.2, B4-B.2, E
7. Mean Time Between Maintenance Actions	236	Shown to the nearest tenth		B	B07	5	060	A3-D.1, A3-D.2, B4-B.3, E
8. Mean Time to Repair	241	Shown to the nearest tenth		B	B07	13	060	A3-D.1, A3-D.2, B4-B.12, B19-E.1, E
9. Item Function	179	Narrative		B	B08	4	060	B2-B.

Table 2 (Continued)

	Data Element	Related DED	Data Item	Data Code	Data Record Record	Card No	Block	LSA Reports	UDB LSAR Data Sheets/ Screen
10.	Qualitative and Quantitative Maintainability Requirements	348	Fail safe environmental nuclear hardened	Narrative entry	B	B09	4	060	B3-B
11.	Maintenance Concept	204	Narrative description		B	B10	4	060	B16-B
12.	Failure Mode Indicator	128	Two-position code	AA-ZZ 00-99	B, B1,	B11-B18	3	060	B5 thru B9-D, B10-C., B11-B., B14-B., B14D-B., B15-B., B17-B., B20-B.
13.	Failure Mode and Cause/Damage Mode	125	Narrative entry related to failure modes and causes		B1	B13	6	060	B5-H., B5D-D
14.	Failure/Damage Effects	120	Narrative entry		B1	B14	6	060	B6-D., B6-D-D
15.	Failure Detection Method	121	Narrative entry		B1	B15	6	060	B7-D., B7D-D
16.	Compensating Provisions	057	Narrative entry		B1	B15	7	060	B8-D., B8D-D

Table 2 (Continued)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Card No	Block	LSA Reports	UDB LSAR Data Sheets/ Screen
17. Task Code	467	Shown using separate data elements of:		C	C06	3	See NOTE 1	B15-E., B17-D., C1-B., C2-B., D1 thru D5, Element B.
a. Task Function Code	001	Access	W	C	C06	3A	004, 016	D2-E.2., E., F2-C., G2-F.
	014	Adjust	D					
	018	Align	E					
	044	Calibrate	F					
	094	Disassemble/ Assemble	S					
	107	End-of-Runway Inspection	Z					
	138	Fault Location	N					
	161	Inspect	A					
	162	Install	G					
	202	Lubricate	P					
	253	Mission Profile Change	M					
	276	Operate	O					
	296	Overhaul	K					
	300	Package/ Unpackage	U					
	332	Preserve	V					
	362	Rebuild	L					
	382	Remove	R					
	383	Remove and Replace	H					
	384	Repair	J					
	413	Service	C					
	482	Test	B					
	505	Transport	Y					

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Table 2 (Continued)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Card No	Block	LSA Reports	UDB LSAR Data Sheets/ Screen
	507	Transportation Preparation	T					
b. Task Internal Code	043	Calendar	Q	C	C06	3B	003	
	078	Daily	C					
	104	Emergency	J					
	257	Monthly	P					
	264	Normal	K					
	297	Overhaul Cycle	R					
	315	Periodic/Phase	E					
	324	Post Flight	H					
	329	Preflight	A					
	359	Quarterly	M					
	398	Scheduled	B					
	401	Semiannually	N					
	438	Special	F					
	533	Unscheduled	G					
	541	Weekly	L					
c. Operations/ Maintenance Level	290	Operator/Crew	C	C	C06	3C	001, 003 004, 007, 015, 017, 020, 053	
	294	Organization/ On-Equipment	O					
	173	Intermediate/ Direct Support	F					
	174	Intermediate/ General Support	H					
	172	Intermediate/ Ashore	G					
	066	Depot	D					

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Table 2 (Continued)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Card No	Block	LSA Reports	UDB LSAR Data Sheets/ Screen
	445	Specialized Repair Activity	L					
18. Task Frequency	470	Number of Annual Occurrences		C	C06	4	002, 006, 008, 011, 012, 013, 014, 015, 019, 023, 060	C1-C
19. Task Identification	472	Narrative entry		C	C06	6	002, 005, 006, 007, 011, 012, 013, 014, 015, 019, 021, 022, 023, 060	C2, D1, D2
20. Task Identification Code	473	Four-Position Code	AAAA thru ZZZZ	C	C06	7	015, 060	None
21. Training Equipment Requirements	394	Yes No	Y N	C	C06	8B	002	C1-E
22. Tool/Support Equipment Requirements Codes	394	Peculiar Tool/SE Common Tool/SE Both Peculiar/ Common Tool/ Support Equipment Not Required	S C B N	C1	C06	8C		C1-E

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Table 2 (Continued)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Data Record Card No	Data Record Block	LSA Reports	UDB LSAR Data Sheets/ Screen
23. Means of Detection	242	Built-in-Test Equipment (BITE)	B	C1	C06	9		C1-F
		Manual Test Equipment (MTE)	M					
		MTE Peculiar	N					
		Automatic Test Equipment (ATE)	A					
		ATE Peculiar	P					
		Human Detection	H					
24. Hazardous Maintenance Procedures Code	155	Potential Loss of Life	A	C1	C06	10	060	C1-G
		Potential Severe Injury	B					
		Potential Minor Injury	C					
		No Danger	D					
25. Technical Manual Code	479	TM Code Entry		C1	C06	12		C1-I, H36-E
26. Sequence Task Description	410	Narrative description of the complete effort to accomplish a specific operational or maintenance task		D	D02	5	015	D1-H
27. Person Identifier	316	Single-digit code	A-Z	D	D02	7	015	D1-I, D3-C.1
28. Referenced Task	376	Heading information		D	D03	7	015	D2-E.

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Table 2 (Continued)

	Data Element	Related DED	Data Item	Data Code	Data Record Record	Card No	Block	LSA Reports	UDB LSAR Data Sheets/ Screen
29.	Mean Elapsed Time	220	Shown in hours		D1	D06	5	015	On A Screens
30.	Personnel Summary	317			D1	D06	7	015	D3
	a. Person Identifier	316	Single-digit code	A-Z	D1	D06	7A		D1-I, D3-C.1
	b. Skill Level Code	422	Basic	B	D1	D06	7B	023	A5-E, D3-C.2
			Intermediate	I					
			Advanced	A					
	c. Skill Specialty Code	423			D1	D06	7C	(see Line 1)	A5-D, D3-C.3, D5-C
	d. Skill Specialty Evaluation Code	433	Adequate	A	D1	D06	7D	002, 019, 433	E, D3-C.6
			Needs Modification	M					
			Establish New SS	E					
	e. Number of Persons per SSC	269	Total Required		D1	D06	7E	019	D3-C.5
	f. Mean M/H per SSC	222	Predicted	M/H	D1	D06	7F	019, 023, 222	D3-C.7
			Measured	M/H					
	g. Task Condition	468	TM/TO not feasible	A	D1	D06	7G	014, 016	D3-C.8
			TMDE/ATE/BIT/BITE required	B					
			Special tools	C					
	h. Performance Standards	313	Supervision required	A	D1	D06	7H	014, 075	D3-C.9
			Precision required	B					
			Time standard	C					
	i. Training Recommendation	504	Class and On-the-Job Training (OJT)	B	D1	D06	7I	014, 023, 060, 075	D3-C.10
			Class	C					
			OJT	J					
			No training	N					

Table 2 (Continued)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Data Record Card No	Data Record Block	LSA Reports	UDB LSAR Data Sheets/ Screen
j. Training Rationale	503	Frequency of Performance	A	D1	D06	7J	014, 060, 075	D3-C.11
		Probable Consequence of Inadequate Performance	B					
		Task Delay Tolerance	C					
		Task Learning Difficulty	D					
		Probability of Deficient Performance	E					
		Immediacy of Performance	F					
		Percent of Work Force Performing the Task	G					
		Percent of Total Work Time Spent Performing the Task	H					
k. Training Location	502	Field Equipment Available	A	D1	D06	7K	014, 060, 075	D3-C.12
		Field Equipment not Available	B					
		Task Learning Difficulty	C					
		Theory, Principle, or Verbalized Concepts Required	D					

Table 2 (Continued)

LSAR Data Element	Related DRD	Data Item	Data Code	Data Record	Card No	Block	LSA Reports	Data Sheets/ Screen
		Probability of Deficient Performance	E					
		Percent of Work Force Performing the Task	F					
		Percent of Total Work Force Performing the Task	G					
1. Task Criticality	469	Critical Not Critical	Y N	D1	D06	7L	006	D3-C.13
31. Quantity per Task	354			D1	D06	9	060	D4-E.
32. Support Equipment Recommendation Data (SERD) Number	458	Four-Position Number		E	E02	3	070	E.
33. Articles Requiring Support	031.1	Six subfields		E	E09	4	070	E.
34. Support Equipment Full Item Name	455.1	Alphanumeric		E	E13	3	070	E.
35. Additional Skills and Special Training Requirements	011	Narrative		E1	E16	5	070	E.
36. Functional Analysis	145.1	Narrative		E1	E17	5	070	

Table 2 (Continued)

	Data Element	Related DED	Data Item	Data Code	Data Record Record	Data Record Card No	Data Record Block	LSA Reports	UDB LSAR Data Sheets/ Screen
37.	Description and Function	086.1	Narrative		E1	E19	5	070	E.
38.	Justification	183	Narrative		E1	E20	5		E., F10-B., G7-E.
39.	New SSC	424	New SSC entered		G1	G01	3	075	G1-B, G2 thru G-8
	End Item Drawing Class	098	Shows Intended Use, Drawing Level, and Proprietary Status		G1	G01	7		A1-E, B1-E, E., F1-E, G1-F
40.	Duty Position Requiring New or Revised Skill	101	Duty Position Entry		G1	G02	4	075	G1-H
41.	SSC from which personnel can be obtained	434	Existing SSC(s) entered		G1	G02	5		G1-I
42.	Test Score	489	Minimum acceptable skill-level score		G1	G02	6		G1-J
43.	Military Rank/Grade	246	Grade necessary to operate, test, or repair system/ equipment		G1	G02	8A	075	G1-L.1

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Table 2 (Continued)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Data Record Card No	Data Record Block	LSA Reports	UDB LSAR Data Sheets/ Screen
44. Civilian Grade	053	Grade necessary to operate, test, or repair system/ equipment		G1	G02	8B	075	G1-L.2
45. Additional Skill Requirements	010	Narrative description of new skills		G3	G04	5	075	G3-E
46. Physical and Mental Requirements	319	Narrative description identifying any unique physical or mental requirements		G4	G05	5	075	G4-E
47. Education Qualification	103	Narrative description of educational prerequisites recommended		G5	G06	5	075	G5-E
48. Additional Training Requirements	013	Narrative description of additional training required for operator, maintenance, and instructor personnel		G6	G07	5	075	G6-E
49. Justification	183	Narrative description of justification for additional personnel and skills		G7	G08	5		E, F10-B, G7-E

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Table 2 (Continued)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Card No	Block	LSA Reports	UDB LSAR Data Sheets/ Screen
50. Source, Maintenance and Recoverability	436	Alphanumeric entry		H	H11	7	061	H32-P., E
51. Supplemental Data-UDB								
a. Data Sheet D5		A. 1. LCN 2. ALC B. Task Code C. SSC D. Work Center E. Estimated number of weeks (training) F. Estimated number of T.O. illustrations (training) G. Estimated number of T.O. pages (training) H. Training costs: 1. UPH 2. Dollar Value						D-5
b. Sequential Task Step	410.1	An optional operand to identify each subtask within a given maintenance task						D1-H
c. Subtask/Task Element Code	451	Identifies the beginning of a subtask or a task element						D1-G

Table 2 (Concluded)

Data Element	Related DED	Data Item	Data Code	Data Record Record	Data Record Card No	Data Record Block	LSA Reports	UDB LSAR Data Sheets/ Screen
d. Referenced Task	376	Provides a line entry of LCN, ALC, and task code for a specified task						D2-E
e. Work Center		Center associated with SSC						D3-C.4, D5-D
f. Mean M/H SSC Allocated	222	Allocated hours entered for the PER ID						D3-C.7

Note: Task Codes are listed on LSA reports: 002, 005, 006, 007, 008, 011, 012, 013, 014, 015, 019, 021, 022, 023, 027, 050, C53, 060, 107, and 075

Table 3
Supplemental Data Elements (UDB 2000)

	Data Element	Related DED	Purpose	UDB Screen/ Sheet Location
1.	Aircrew Man-Minutes (QuickTurnaround Time)	S-001	Field Data Collection	All D.3.
2.	Analytical Condition Inspection (ACI)	S-003	Field Data Collection	All E.
3.	Base-Level Maintenance Man-Hours/Flight Hours (BASE LEVEL MMH/FH)	S-004	R&M Tracking Report	A9, B19 C.
4.	Base-Level Mean Maintenance Man-Hours (BASE LEVEL MMH)	S-005	R&M Tracking Report	B19 D.
5.	Built-In Test/Central Integrated Test System Adequacy (BIT/CITS ADEQUACY)	S-006	Field Data Collection	B18 G.
6.	Component Repair/Overhaul	S-007	Field Data Collection	All B.2.
7.	Corrective Maintenance	S-008	R&M Tracking Report	A9., B.4.
8.	Depot Maintenance Man-Hours Per Flight Hour	S-009	R&M Tracking Report	All B., B19 E.
9.	Dollar Value	S-010	Costs for Item(s) and Service	D5 H.2.
10.	Elapsed Time (Minutes)	S-011	R&M Tracking Report	All D.1.
11.	Estimated Number of Technical Order Illustrations (Training)	S-013	To Aid In Task Performance	D5 G.
12.	Estimated Number of Technical Order Pages (Training)	S-014	To Aid In Task Performance	D5 F.
13.	Estimated Number of Weeks (Training)	S-015	To Aid Training Development	D5 E.
14.	Facility Type Code	S-016	Facility Utilization Report	F1 J.
15.	False Fault Indication (Percent)	S-017	Field Data Collection	B18 G.3.
16.	Fault Detection (Percent)	S-018	Field Data Collection	B18 G.3.
17.	Fault Isolation (Percent)	S-019	Field Data Collection	B18 G.2.
18.	Flight Test (FLT TEST)	S-020	Field Data Collection	A8 C.1.a + C.2.a
19.	Full Mission Capable (Percent)	S-021	AF Availability Requirement	A8 B.5.
20.	Grand Total Base-Level Maintenance Manhours Per Flight Hour	S-022	R&M Tracking Report	A10 B.
21.	Home Station Check	S-023	Field Data Collection	A10 E.
22.	Intermediate-Inspection	S-024	R&M Tracking Report	A10 F.
23.	Intermediate Level (Off-Equipment)	S-025	R&M Tracking Report	B19 C.2.
24.	Line Replaceable Unit/Shop Replaceable Unit Code (LRU/SRU)	S-026	ICS Requirements	B18 F.
25.	Maintenance Down Time Per Sortie	S-027	AF Availability Requirement	A8 B.6.

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Table 3 (Continued)

Data Element	Related DED	Purpose	UDB Screen/ Sheet Location
26. Maintenance Man-Minutes	S-028	R&M Tracking Report	A11 D.2.
27. Mature (Sub-element of WSR)	S-029	AF Availability Requirement	A8 C.1.c. + C.2.c.
28. Mean Crew Size	S-030	R&M Tracking Report	A11 C.3., A11 D.4.
29. Mean Man-Hours to Repair (Sub-element of AC1)	S-031	R&M Tracking Report	A10 C.
30. Mean Time Between Corrective Maintenance (MTBM CORRECTIVE)	S-032	Summary of Corrective MTBM	B4 B.9.
31. Mission Reconfiguration Time	S-033	Field Data Collection	A11 C.
32. More	S-034	User Information	A1, B1, H31, J1, DCN1
33. Next Higher Assembly Federal Supply Code for Manufacturers	S-035	NHA Relationship Not Tied to LCN Structure	B18 D.
34. Next Higher Assembly Manufacturers Part Number	S-036	NHA Relationship Not Tied to LCN Structure	B18 B.
35. Ninetieth Percentile (90TH PERCENTILE)	S-037	Field Data Collection	A11 C.2.
36. Not Mission Capabile (Percent)	S-038	AF Availability Requirement	A8 B.7.
37. Not Mission Capable Both Maintenance and Supply (Percent)	S-039	AF Availability Requirement	A8 B.10.
38. Not Mission Capable Maintenance	S-040	AF Availability Requirement	A8 B.8.
39. Not Mission Capable Supply	S-041	AF Availability Requirement	A8 B.9.
40. Number (NO.)	S-042	User's Key	DCN1D., DCN2B.
41. Operational Readiness Evaluation (ORE)	S-043	AF Availability Requirement	A8 C.1.b + C.2.b
42. Organizational Level (On Equipment)	S-044	R&M Tracking Report	B19 C.1.
43. Partial Mission Capable (Percent)	S-045	AF Availability Requirement	A8 B.1.
44. Partial Mission Capable Both Maintenance and Supply (Percent)	S-046	AF Availability Requirement	A8 B.4.
45. Partial Mission Capable Maintenance (Percent)	S-047	AF Availability Requirement	A8 B.2.
46. Partial Mission Capable Supply (Percent)	S-048	AF Availability Requirement	A8 B.3.

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Table 3 (Concluded)

Data Element	Related DED	Purpose	UDB Screen/ Sheet Location
47. Preventive Maintenance Man-Hours Per Flight Hour	S-049	R&M Tracking Report	A9 B.3.
48. Programmed Depot Maintenance	S-050	Field Data Collection	A11 B.1.
49. Quick-Turnaround Time	S-051	Field Data Collection	A11 D.1.
50. Ratio of Maintenance Action to Maintenance Events	S-052	Field Data Collection	B19 B.
51. Reference (REF)	S-053	Referencing Task Narrative	D1 K.
52. Referenced Line Numbers	S-054	Referencing Task Narrative	D2 F.
53. Referencing Line Number	S-055	Referencing Task Narrative	D2 D.
54. Scheduled and Special Inspections	S-056	R&M Tracking Report	A9 B.2.
55. Sequential Task Step (SEQ TASK STEP)	S-058	User's Key	D1 D.
56. Support General	S-059	R&M Tracking Report	A9 B.1.
57. System or End Item Availability	S-060	AF Availability Requirement	A8
58. Total Base-Level Maintenance Manhours Per Flight Hour	S-061	R&M Tracking Report	A9 B.5., B19 C.3.
59. Training Cost	S-062	Actual Cost, Estimated or Proposed Cost	D5 H.
60. Type	S-063	Serves same purpose as NHA PLISN Indicator but has added codes to capture SAME AS & PRIOR ITEM PLISN Indicators	H32 M.2.
61. Unit Number	S-064	Useful to contractor for internal numbering of units	B18 E.
62. Weapon Systems Reliability (WSR)	S-065	AF Availability Requirement	A8 C.
63. Work Breakdown Structure (WBS)	S-066	Added because -2A does not have cross-reference of LCN to WBS.	A1P, B1P, LCN G.
64. Work Center Code	S-067	Requiremnet of DoDD 5000.39 Shows work center for which the Skill Specialty Code(s) are required	D3 C.4., D5 D.

Source: Data Element Descriptions for the UDB2000 Unified Database fo. Acquisition Logistics, Integrated Support Systems, Inc., June 1986

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4.6 MANPOWER, PERSONNEL, AND TRAINING (MPT) DIRECTORATE

A. The recently established ASD/ALH Directorate should become a vital element in the integration of MPT issues in the acquisition cycle. The basic purpose of MPT analysis, which is to quantify impacts on both current and planned weapon systems and to develop alternative MPT utilization concepts and system designs to optimize the effectiveness of our forces, can be more fully realized as the Directorate expands its involvement within the acquisition community. In this effort, ALH will be focusing on improvements in maintenance and support of MPT issues and reflecting upon the concerns and planning efforts of the using commands, supporting commands, and program offices.

B. Under the Directorate's concept of operations, the development of databases and analytical techniques for MPT considerations in the design process will unfold. ALH should also aid the SPO in establishing an MPT baseline and handling impacts caused by design, operations, or maintenance concept changes. Policy review and development will be a key role of this office, and management must consolidate present MPT efforts and serve as the final clearing house on all matters of MPT direction and issues.

C. The Directorate should eventually provide MPT expertise to the Program Offices and advise, assist, and provide information, models, and methodologies to support all aspects of MPT planning. In this manner, the SPOs should be able to compare, project, and assess various design options and operational and maintenance trade-offs for their relative impacts on MPT and life-cycle costs. This capability, when formalized, should also help eliminate costly changes in planning, programming, and funding of MPT resources due to incomplete front-end analysis.

4.7 RECOMMENDATIONS

A. Manpower, personnel, and training should be given adequate consideration as part of the front-end analysis, with FEA applied early in the Concept Exploration (CE) and Demonstration (DEM/VAL) phases.

B. MPT or training requirements should be afforded the same level of interest as the systems engineering during the acquisition process. Training managers must have sufficient authority to influence MPT requirements for training system design.

C. Design data requirements should be placed on contract for MPT purposes early in the CE and DEM/VAL phases, through selected listings on the CDRLs and the tailoring of data item descriptions (DIDs). The Training Development Plan should be expanded to include those DIDs required for training data, and updated as necessary after program reviews.

D. Program reviews and other planning meetings should be attended by all MPT- and LSA-involved members on a regular basis. Reviews, planning meetings, working groups, and briefings should be coordinated efforts

-- whether conducted by the SPO, SIMSPO, ATC, or the contractor -- in an effort to keep the flow of information and data on a continuous, parallel course.

E. Interfaces should be established and maintained during acquisition phases between the SPO training and LSA managers, SIMSPO MPT managers, and prime contractor training system and LSA managers.

F. Automated LSAR systems should be adopted, with on-line capability from the contractor to the SPO and Responsible Test Agency for ISD.

G. SPO training and LSA managers should be scheduled to attend, as a minimum, the following courses:

Air Force MPT Systems Model Course (conducted by Booz, Allen, Hamilton, Inc., for the SIMSPO).

LSA/LSAR Course (conducted by AFALC/ERL)

H. A new data element descriptor (DED) should be established for Student Target Population, to permit a narrative summary and listing for skill-level code, skill specialty code, prerequisite education and training, previous weapon system experience, and security clearance.

I. DED 503 (Training Rationale) should be examined for change to a narrative entry to justify training requirements or be replaced by DED 183 (Justification). In addition, this type of information should be examined for inclusion in LSAR reports 070 and 075.

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VI. GLOSSARY OF TERMS AND ACRONYMS

AFALC	Air Force Acquisition Logistics Center
AFB	Air Force Base
AFHRL	Air Force Human Resources Laboratory
AFLC	Air Force Logistics Command
AFS	Air Force Specialty
AFSC	Air Force Specialty Code
ALC	Air Logistics Center
AMT	Aircraft Maintenance Training
AFOTEC	Air Force Operational Test and Evaluation Center
ASD	Aeronautical Systems Division
ATC	Air Training Command
CDRL	Contract Data Requirements List
CE	Concept Exploration
DED	Data Element Dictionary
DEM/VAL	Demonstration/Validation
DID	Data Item Description
DPML	Deputy Program Manager for Logistics
FEA	Front-End Analysis
FSD	Full-Scale Development
FTD	Field Training Detachment
ICS	Interim Contractor Support
IDD	Integrated Data Dictionary
IDMS	Integrated Data Management System
ILS	Integrated Logistics Support
ILSP	Integrated Logistics Support Plan
IOC	Initial Operational Capability

ISD	Instructional System Development
ISLM	Integrated Logistics Support Manager
LCN	Logistics Support Analysis Control Number
LSA	Logistic Support Analysis
LSAR	Logistics Support Analysis Record
MPT	Manpower, Personnel, and Training
MRSA	Material Readiness Support Activity (Army)
MTT	Mobile Training Team
NHA	Next Higher Assembly
PLISN	Provisioning List Item Sequence Number
PM	Program Manager
PMD	Program Management Directive
PMP	Program Management Plan
PPBS	Planning, Programming, and Budgeting System
PRP	Program Review Package
RFP	Request for Proposal
R&M	Reliability and Maintainability
RTA	Responsible Test Agency
SASC	Systems and Applied Sciences Corporation
SME	Subject-Matter Expert
SMS	Subject-Matter Specialist
SPO	System Program Office
SON	Statement of Operational Need
SOW	Statement of Work
TDP	Training Development Plan
TES	Test and Evaluation Squadron
TRRRM	Training Requirements Recommendation Review Meeting

TIES	Task Identification and Evaluation System
TTC	Technical Training Center
UDB	Unified Data Base
WBS	Work Breakdown Structure
W-P AFB	Wright-Patterson Air Force Base